The Dock & Harbour Authority

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To Correspondents

All Letters and Contributions intended for Publication should be addressed to the Editor, K. R. Doggett, Assoc.I.C.E., "THE DOCK AND HARBOUR AUTHORITY," 19, Harcourt Street, London, W.1, and must in all cases be accompanied by the name and address of the sender.

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The Dock & Harbour Authority

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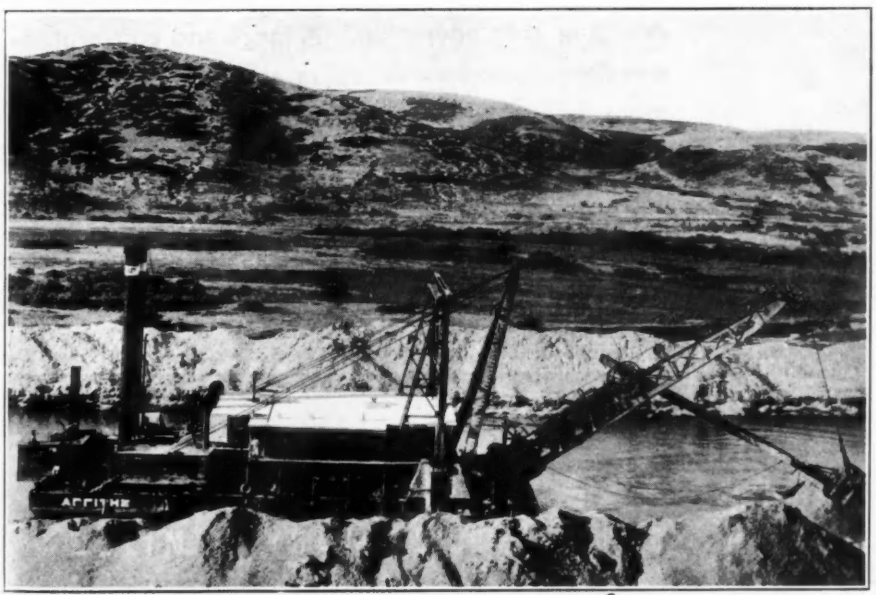

6-Yard Oil-Fired Steam Dipper Dredger built for the Greek Government. Output 255 cubic yards of cobbles and boulders per hour dumped to a radius of 90 feet and a clear height of 30 feet.

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Editorial Comments

THE PORTS OF MOZAMBIQUE.

The Portuguese became interested in the ports of Mozambique in 1498, when Vasco de Gama discovered the sea route to India, via the Cape. In the early months of that year, he entered the bay of Inhambane, and the estuary of the Pungue river, on which is now situated the port of Beira, and on the 9th of May, he anchored at Quelimane and afterwards in the bay of Mozambique. Some years later, during the second voyage of Gama to the Indies, Delagoa Bay was discovered, the captain of one of his vessels, Antonio do Campo, entering it for the first time in 1504.

A settlement was formed here which for many years had the name of Porto de la Goa, from the fact that vessels called there on the voyage back from Goa in India. As the settlements and ports became established, the Portuguese constructed fortresses for their protection from the inhabitants of Zanzibar, who were rivals on the sea routes for the commerce of India. The forts also served as a defence against attacks of pirates from the sea and from aborigines.

Despite the fact that the country and ports of Mozambique were definitely settled first by the Portuguese, there was considerable rivalry between England, France and Holland for the trade of the ports of Lourenço Marques, Inhambane, Quelimane and Mozambique, and several attempts were made to obtain actual possession of them, until the whole question of ownership was settled by arbitration some time towards the end of the 18th century.

The first railway to be constructed in the colony was completed in 1894, and ran from Lourenço Marques to the frontier of the Transvaal, following agreements reached with that country, after protracted negotiations commenced in 1875. The railway from Beira was constructed between 1897 and 1899 by a private company, as indeed were all the others which followed in the years 1912 and onwards, from other ports to the interior, the principal ones linking up with those of the neighbouring territories of Rhodesia and Nyassaland. Roads were, from time to time, planned and constructed by the Portuguese Government, and at the present time the whole system, including docks, is becoming gradually administered solely by the Government.

In this issue we publish an article upon the Ports of Mozambique in which it is stressed that from a geographical point of view they, together with the railways which serve them, occupy a singularly strategic position in the economic distribution, to other parts of the world, of the products of large areas of Central Africa.

That the Portuguese Government is aware of the responsibilities attending this position is shown by its readiness to spend large sums of money upon, not only the extension of existing port facilities and railways, but upon an entirely new port—the Port of Nacala. Also, since Beira and its railway were taken over in 1949, plans have been announced, as a short term measure, for much needed improvements in mechanization and shed accommodation in the port, and orders have been placed for new rolling stock and locomotives. It is also interesting to note that a study is being made of the existing port facilities at Lourenço Marques, where improvements are necessary to enable this port to fill efficiently, the important roll it is destined to take in the further development of the country.

Readers will examine with interest the design and layout of the modern new Port of Nacala, the design of the quay walls taking the form of concrete block work, so popular among Portuguese engineers, another example being the harbour work at present under construction on the River Tagus in the Port of Lisbon.

The execution of the schemes outlined in the article will involve heavy expenditure and will take some years to complete, but it is obvious that the projects form a definite step in the economic development of Portuguese East Africa and will also assist other highly productive areas of the African interior.

PORT OF BEIRA CONVENTION SIGNED.

In view of the frequent criticisms in the press, that have been so freely expressed during the past few months, as to the congestion and shipping delays at the Port of Beira, the recent announcement that agreement has been reached for the improvement of the port will be received with satisfaction by all concerned.

The 20-year Convention which was signed in Lisbon a few weeks ago between representatives of the Portuguese, United Kingdom and Southern Rhodesia Governments applies to the territories of Mozambique, Southern and Northern Rhodesia and Nyassaland, and besides making provision for the improvement of the Beira railway and port facilities, also agrees to the establishment of a free zone for the handling of goods proceeding to or from these territories, and the setting up of an advisory board, on which shipping interests will be represented, to advise on the best means of facilitating and developing traffic passing through the port and over the railway.

For their part, the Portuguese Government has undertaken to maintain the port and the Beira Railway in a state of efficiency, adequate for the traffic to and from the British and Portuguese territories, and to expedite the handling of cargoes and the clearance of ships and railway transport. In return the United Kingdom and Southern Rhodesia Governments have agreed to take all reasonable steps to prevent discrimination against traffic for which Beira is the natural inlet or outlet. In addition, agreed preferential rates are to be maintained in favour of Beira, and all three Governments have agreed to consult together if the traffic falls substantially below the full working capacity of the port and railway.

Editorial Comments—continued

RHODESIA'S TRANSPORT PROBLEMS.

Although the outcome of the negotiations referred to above are welcome and encouraging, concern is still apparent regarding the development and expansion of the Rhodesias. Sir Godfrey Huggins, Prime Minister of Southern Rhodesia, has emphasised that the improvement of the railway and port of Beira is not the only transport problem facing British Central Africa; and other outlets to the sea are urgently needed.

It also has been stated by Mr. G. A. Davenport, the Rhodesian Minister of Mines and Transport, that at the present rate of expansion, the imports and exports of the country will reach a total of at least 11,000,000 tons a year in about eleven years' time, and thereafter, a port in addition to those in Portuguese East Africa will be essential.

Further developments are therefore highly probable at no distant date, and many schemes which have been suggested during the past few years are receiving careful consideration. Among these are the proposals to build a new railway through Beitbridge to link up with Lourenço Marques and the development of the Benguela Railway and the port of Lobito Bay, on the West Coast of Africa.

This latter plan, which has support from many influential quarters, would provide the shortest route to Europe and also to the Western hemisphere, Lobito Bay being 2,500 miles nearer to the Americas than Beira. It is doubtful, however, whether the saving in shipping costs would offset the heavy increase in railway costs which the long overland hauls would involve.

Other proposals include the building of a trunk line from the Broken Hill area of Northern Rhodesia in a north-easterly direction to and through Tanganyika Territory in order to provide access to the sea at Dar-es-Salaam, and also eventually by a branch line to the new port of Mtwara.

BELGIAN INTEREST IN THE PORT OF DAR-ES-SALAAM.

Added interest in these possible developments is shown by the announcement, made in Tanganyika a few weeks ago, that the Belgian Government is considering spending £1,000,000 (sterling) on the construction of a deep water berth at the port of Dar-es-Salaam. The berth will be used by Belgian vessels, or by ships of other nationalities carrying cargo for the Belgian Congo, and will be in addition to the two other berths which are already planned.

It will be recalled that considerable extensions to this port have been under consideration for some years past, and Messrs. Coode, Vaughan-Lee, Frank & Gwyther, Consulting Engineers to the Crown Agents for the Colonies, have completed the plans for the two deep-water berths mentioned above. We understand that tenders will shortly be invited, after the interested engineering firms have visited Dar-es-Salaam and made their own investigations on technical and other points.

This new Belgian scheme is significant, and, taken in conjunction with the other proposals mentioned in the previous comment, it seems highly probable that, in years to come, still further extensions will make the port of Dar-es-Salaam one of the major ports of the Continent of Africa.

A NEW METHOD IN WATER TRANSPORT.

On another page will be found an article which describes a new form of amphibious barge or container unit, which has been invented and is being experimented with, in Germany.

It is possible that in countries containing large and wide canals and locks, such as are usual on the Continent and in the United States of America, the invention will find ready support, for it contains features of undoubted interest which can be put to practical use in such waterways.

Also, as is the case with many other inventions, although perhaps they cannot be directly applied in their entirety, in circumstances and situations other than those for which they were originally designed, there is always the possibility that the general principle involved could be used or modified, or that it may contain the germ of some other idea, more applicable to the particular circumstances with which the interested reader is concerned.

Our contributor mentions several ways in which, in his view, the new container unit might be adapted to the needs of canals and waterways in the United Kingdom, and it certainly seems that the possibilities should be explored.

NEW CARGO HANDLING DEVICES.

We also are publishing, in this issue, details of three inventions by a member of the American Merchant Marine which are worthy of most careful study, for Mr. Farrell is reported to have succeeded in increasing the speed of loading and discharging vessels by as much as 50%.

The advantage of the "rolling decks," as the inventor points out, is that cargo which is not directly accessible by crane and which would normally have to be moved by hand or truck, can be simply slid under the hatchway in a reversal of the loading process and removed easily without any manual work.

It is a noteworthy fact that the increase in size of cargo vessels, together with the cargo carrying passenger liners, has actually, in many cases, resulted in a reduced hatch area per unit of volume, which tends towards a longer "turn round" time in port. Anything which mitigates this retrogade tendency is deserving of the closest scrutiny, and our previous remarks as to the direct employment of inventions are also applicable here.

If Mr. Farrell's claims are substantiated, there seems little question that the new devices may have an important bearing upon cargo handling methods and the future design of merchant ships.

DREDGING AT NEW ZEALAND HARBOURS.

The recently announced agreement of five East Coast ports in New Zealand to pool at no far distant date their dredging plant, appears to be a commendable decision and one which can easily be put into effect where the ports are under the direction of Harbour Boards.

Such proposals are, however, fraught with some difficulty owing to the probability that the dredging requirements of each port are likely to be dissimilar, so that the size and type of plant must vary accordingly. A suction dredger which will work perfectly and economically in sand at one port, may be quite useless in another, where silt and mud, or even another type of sand to be removed will not "run." There is also the hazard of towing from one port to another, and perhaps through stormy seas, unwieldy craft such as dredgers built for dock work or estuarial waters.

In the United Kingdom, and in many European ports, the majority of dredgers owned by port authorities and used solely for maintenance work, are more or less fully occupied. There are also a considerable number of dredging contractors who, through the volume and diversity of the work undertaken by them, have at their command dredgers of many sizes and types capable of carrying out, on a contract basis, new dredging schemes and routine work, wherever required. New Zealand, on the other hand, has not this advantage.

The remark made by the New Zealand committee of investigation, in their report, that "the attention of all concerned with shipping might be drawn to the fact that much of the dues paid by shipping is absorbed in dredging operations to maintain the ports at their present depths," is one which we think has special significance. It leads, naturally, to the question of the trend in size of cargo vessels and to speculation as to whether the maximum economic dimensions of vessels has not been reached, having regard to all the circumstances which affect the ship owner, together with those which concern the Harbour Authority, i.e., the natural and economic limits to which harbours, docks and navigation channels can be made and maintained.

On the whole, it is probable that the New Zealand scheme may not be so attractive in this country, although there have, of course, been occasions when dredgers have been loaned from one port to another. Moreover, in the U.S.A., all dredging of harbours and waterways is carried out by the Government, so that some interchange of plant naturally follows there already.

Saving in dredging costs tends to a reduction in harbour dues, and to lower costs to the consumer; the possibilities of the New Zealand scheme being applied in the United Kingdom therefore merit exploration.

The Ports of Mozambique

With a Special Description of the Nacala Harbour Project

(SPECIALLY CONTRIBUTED)

INTRODUCTORY

MOZAMBIQUE, or Portuguese East Africa, has an area of over 428,000 sq. miles, with a length of coast line of about 1,600 miles and a depth varying from some 200 to 500 miles. It has a rich and almost virgin hinterland of great agricultural and mineral importance, watered by many rivers, the principal ones being the Rivers Limpopo and Zambesi and, at the northern boundary, the Rovuma River.

The ports at the present time, from south to north of the coast line, are: Lourenco Marques, Vila dè Jaoa Belo, Inhambane, Beira, Chinde, Quelimane and Mozambique; while the projected port of Nacala, situated some 100 miles north of Mozambique, is destined to take an important position in the future. Some of the ports mentioned are mere anchorages with very little equipment or facilities, loading and unloading being accomplished from lighters, with the aid of vessels' own gear. All the ports are jointly administered by the State and the railways, where they exist, which serve them.

The agricultural and mining products of the greater part of Southern Central Africa can only economically reach the consuming markets overseas through the ports in Mozambique—the natural gateways for exports and imports.

It was early realised by the Portuguese Government that geographical conditions placed in their hands the most important key position of Central African development and progress. At least three of the above ports seemed to be destined to take important roles in the development of Central Africa, and to fill the post-war pressing need of the world to take full advantage of the richness of those new and almost unexploited resources.

Accordingly, the Portuguese prepared themselves to face the responsibilities of this position of privilege, not only by taking over the port and railways of Beira, previously owned and administered by a private company, and by building and improving the ports by modern reconstruction works and up-to-date equipment, but by providing facilities for full use of them to be made, and by promoting and maintaining friendly relations with their neighbours.

In order to be of assistance to these neighbouring territories, Portuguese East Africa has been divided into three zones, each served by one of the following three main ports: Lourenco Marques, Beira and the port of Nacala, now in course of construction. These ports are the only ones that have any international importance.

At the same time these and the minor ports, limited in some cases by the extent of the metalled roads and railways to the interior, serve the needs of the Portuguese territory itself in the following manner:—

South of the Save River:—Lourenco Marques, Vila dè Joao Belo and Inhambane.

Between the Save River and the Zambesi River:—Beira and Chinde.

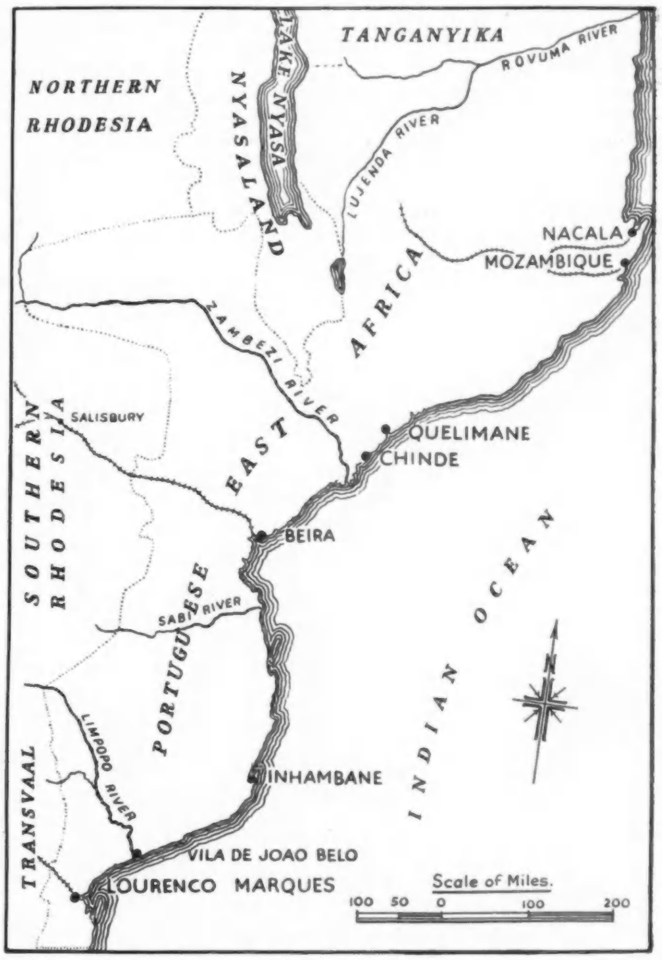
North of the Zambesi:—Quelimane and Mozambique.

THE RAILWAYS AND ROADS OF MOZAMBIQUE

The country is served by three main railway systems, having a total length of 1,500 miles, which penetrate to the neighbouring territories and are connected to their transport systems.

Each of these railways lies within one or other of the zones of administration mentioned and is connected to the principal port therein. For example, Lourenco Marques is the port terminus of the southernmost railway which runs direct to Pretoria by two routes and is thus connected with the whole of the South African and Rhodesian railway systems. There is also a line to Saba on the borders of Swaziland, but the projected line into the interior has not yet been put in hand, as had been anticipated in 1912.

The railway serving the centre zone and its port runs from Beira into Southern Rhodesia and, connected to the interior railways of that territory, goes on to Buluwayo and thus to the south and north through Northern Rhodesia to the Belgian Congo, connection also being made into Nyassaland.



The port of Nacala will also be connected with Rhodesia and Nyassaland through a railway line 300 miles long, which should make the port the natural outlet of those territories, particularly the western regions of Northern Rhodesia. Nacala is already linked to the railway system of the north of Mozambique by a line which has been serving that area for some years past.

The earlier constructed metalled roads did not conform to an overall plan, due to the difficulties of foreseeing what might be required in a territory so young and of such proportions as Mozambique. In spite of the difficulties, however, the Portuguese Government instituted a public department in the colony for the purpose of studying both railways and roads, and their inter-related development and extension in conformity with the policy of serving internationally the great inland territories as well as

The Ports of Mozambique—continued

the needs of the colony itself. This work continues and is naturally of great importance.

Among proposals put forward is the double tracking of the railway from Beira to Salisbury and the West Nicholson-Beitbridge connection, together with improvements of the South African Railways line between Beitbridge and Komatipoort and, as an alternative, a connection between West Nicholson and Guija, on the lower Limpopo River, which is the terminus of the railway from Lourenco Marques.

THE THREE PRINCIPAL PORTS

Lourenco Marques.

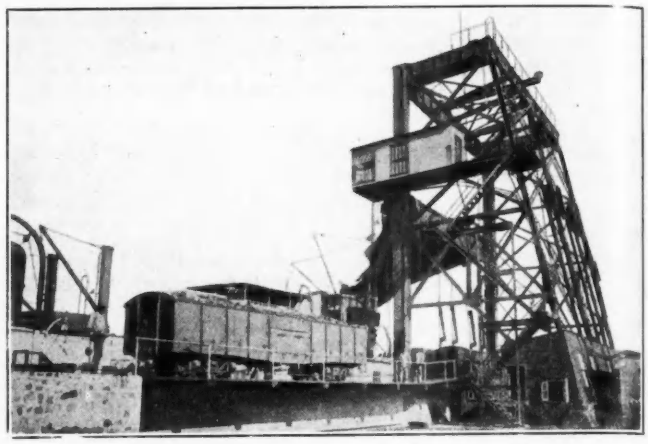
This port is the natural outlet for the Transvaal, Swaziland and Southern Rhodesia, and is the main port of Portuguese East Africa, having a reputation for quick despatch.

It possesses a quay 2,200 yards long, of reinforced concrete, which can berth 15 large vessels, and a further 300 yards are being built with a view to future requirements. Equipment of the quay includes 40 or so electric cranes with hoisting capacities of 3 and 5 tons, several 10 and 15 ton cranes, and a heavy lift of 80 tons. There are also a dozen 2 ton and 3½ ton mobile cranes, and a number of electric tractors, each capable of towing 40 tons.

Fourteen sheds alongside the quay can store 200,000 tons of general goods, and there are storage areas to accommodate 50,000 tons of coal and 30,000 tons of mineral ore, besides ample timber storage facilities. The sheds are provided with "Burtoning" mast facilities for direct loading into trucks or quay from ships' derricks.

Modern cold storage and cooling facilities for fruits for export has been erected, having a storage capacity of 1,700 tons. A cold storage for fish, as well as an ice factory for fishing purposes, are also being built on the quayside and are expected to be put into use almost immediately. This new cold storage for fish may encourage the development of the fishing industry at Lourenço Marques, where only half-a-dozen inshore line fishing boats and one large deep sea trawler are operating at present.

The handling of coal is dealt with at the western end of the harbour, and coaling can be accomplished at a speed of 500 tons per hour. Loading and discharge of oil in bulk is effected at the oil berths at Matola Bridge, and fuel oils and petrol for bunkering purposes are available along the main quay.



One of the two Coaling Installations at Lourenço Marques.

Though the port is far from having reached its total capacity, a substantial increase of traffic is shown in the returns of the last five years. In view of the fact that the port is equipped with two coaling plants with the total capacity of about 4,000,000 tons per year these figures might have been greatly improved had coal supplies from the Transvaal been more abundant.

Technical and economic investigations (some of which are financed by E.C.A. Funds) are still proceeding in respect to the development of ports and railways in Mozambique, and working parties will closely examine the extent to which port improvements are likely to be required in the near future at Lourenco Marques.

Beira.

Until a little more than 20 years ago Beira was simply a lighterage port, and ocean-going vessels lay in the estuary of the Pungue River within a few hundred yards of the shore, the lighters being loaded and discharged at wharves in the Chiveve Creek.

In 1927, after consultation with the Portuguese Government, the three companies of the Port of Beira, Mozambique, and the associated British company, Beira Works, came to an agreement, by which they became responsible for the construction of deep water wharves and other facilities which had become urgently necessary to deal with the rapidly increasing volume of traffic which was passing through the port.

The first phase of construction of deep water wharfage, was a length of 1,800-ft., which provided three berths for handling large tonnages of general export and import cargo and mineral exports. The wharf was built on cast iron screw cylinders, 3-ft. diameter, with a heavy steel superstructure carrying the deck, together with, at the rear of the wharf, composite piles of reinforced concrete and timber supporting the sheds and their floors. The lighterage wharf was also extended and joined up with the deep water quay, and at the same time, the extensive tidal mud flats between the wharves and the shore were gradually reclaimed by pumping ashore material dredged from the river and ship berths and channels. After the depression of the 1930's, a large increase in the volume of traffic necessitated a further extension of the wharf and other facilities, and the work was accordingly put in hand.

General View of the Main Quay at the Port of Lourenço Marques.

The Ports of Mozambique—*continued*

Port of Beira, aerial view showing Wharves and Anchorage.

To-day Beira is the second port of Mozambique and the chief port of entry for Nyassaland and Rhodesia besides serving also the Belgian Congo.

The entrance to the harbour is well buoyed, having nine luminous buoys and two beacons to enable vessels to enter or leave at night. An extensive dredging programme undertaken before the war gave a channel depth of 37-ft. at High Water and 16-ft. at Low Water Spring Tides, while deepening now in progress will increase the depth at Low Water to 18-ft.

At the present time, there are five berths with 33-ft. of water and three transit sheds at the deep water quay, which is about 3,000-ft. in length, and the lighterage quay is now some 1,500-ft. long. Vessels 500-ft. long and drawing 27-ft. may swing at moorings.

The port is capable of handling 3,000 tons of cargo per day by lighters, and 4,500 tons at the main quay, which is equipped with nine ½-ton and fifteen 3-ton cranes. There are in addition cranes of 5 and 20 tons capacity, besides diesel mobile cranes and tractors. Coal is stored ashore and ships can be bunkered while at berths, but oil bunkering is carried out at a special berth.

The failure of crops in the hinterland, soon after the war, necessitating importation of maize in large quantities coupled with increasing general traffic and lack of rolling stock and locomotives, caused the inevitable result of congestion and delay at the port. It became clear, in spite of temporary expedients and the acquisition of new railway stock, that both the port and railway facilities would need to be greatly increased to deal efficiently with the volume of traffic which might be expected in the immediate future, due to the post-war economic situation and world shortage of raw materials and food.

It was perhaps fortunate that certain charters and concessions held by various companies in Mozambique expired during the last few years. Thus when, in January, 1949, the Portuguese Government took over the administration of the Port of Beira, and some months later the railway therefrom to the Southern Rhodesian border, they were enabled to deal with the whole question of ports and railways in the territory on a wide and international basis, involving schemes which would be partly financed by E.C.A. funds.

While, in the short time which has elapsed, improvement in mechanisation and shed capacity at the port has been effected and temporary arrangements made with the Rhodesian Railway Company for the provision of railway equipment, considerable extensions to the port, and to the railway as already mentioned, are planned to be undertaken as soon as possible.

The port works, it is understood, will include two additional deep water berths at the Pungue main wharf and possibly an additional berth for oil tankers. Several transit cargo sheds will be provided, together with an increase in electric crane and cargo handling equipment. Moreover the development of the Tete coalfield, on the Zambesi with the help of E.C.A. funds, projected by the Portuguese Government will necessitate the provision of bulk coal handling equipment at Beira, the port being connected to the Colliery by a railway crossing the Zambesi Bridge.

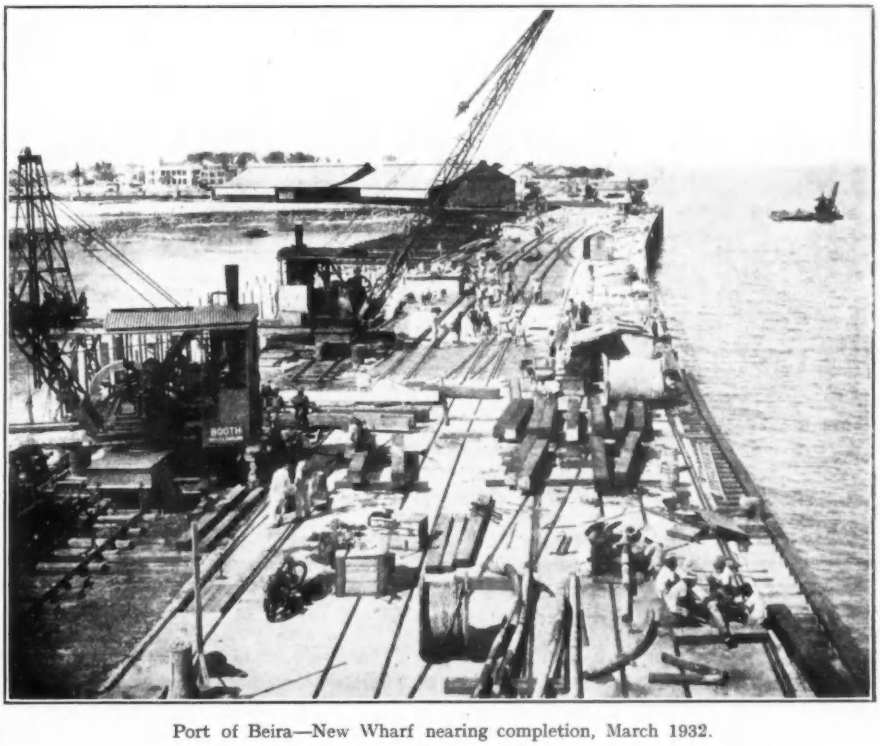
Nacala.

The Port of Nacala, it is envisaged, will be the third important port of Portuguese East Africa for international traffic, and preliminary work on the construction of the new harbour was commenced in December, 1947.

The geographical position of Nacala, together with the natural configuration of the bays that constitute the site of the harbour make it possible to construct a commercial port capable of satisfying the requirements, however great, of both Portuguese and neighbouring territories.

In the great Bay of Fernao Veloso, in the Indian Ocean, there exists a strait with a channel large and deep enough for the largest vessels, which gives safe and easy access to three other interior bays, ample, deep and well protected — Namelala, Muananculo and Benco — and it is on the east side of the latter at Point Maiaia that the Port of Nacala is planned.

The port will be joined to the railway system of the north of Mozambique by a line which has already been built, and thus should obtain great importance as the head of the railway line penetrating to Lake Nyassa.



Port of Beira—New Wharf nearing completion, March 1932.

The Ports of Mozambique—continued

PORT OF NACALA

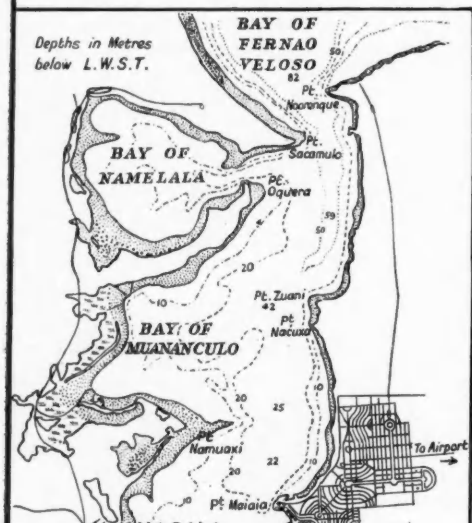


Fig. 1.—DISTRICT MAP.

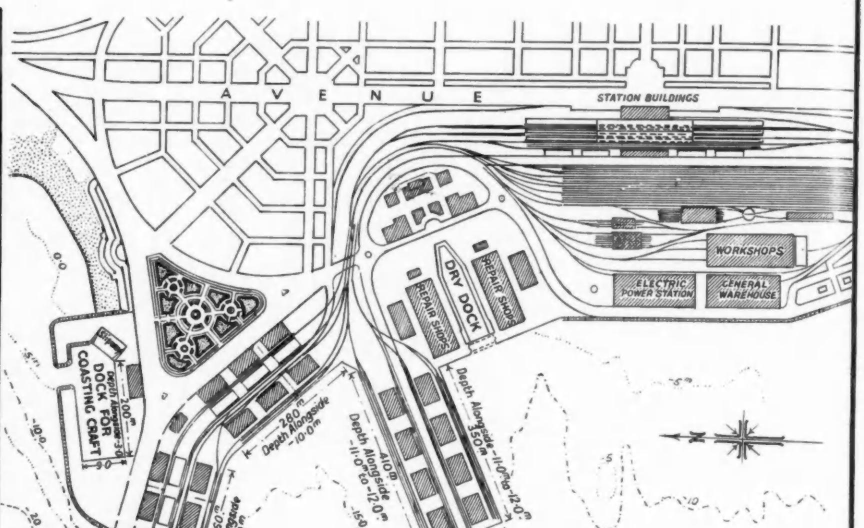


Fig. 2 — GENERAL PLAN.

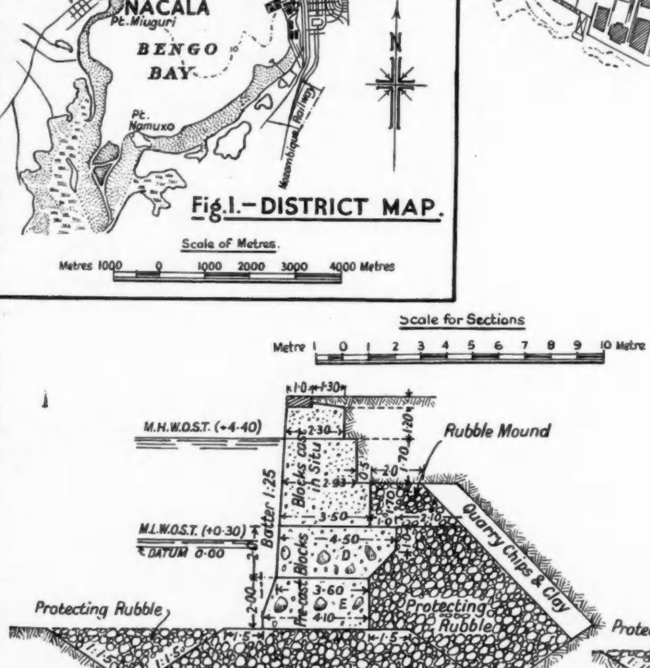


Fig. 4.—QUAY WALL FOR COASTING CRAFT.

Fig. 3.—QUAY WALL FOR OCEAN STEAMERS.

Construction of the Port of Nacala

By Engineer E. SANCHES DA GAMA

Chief Inspector of Portuguese Colonial Development.

This port, terminus of one of the branches of the Mozambique Railway, has excellent natural facilities. It was studied in 1940 by a mission directed by the Engineer of Maritime Works, Mr. Viriato Canas, with the object of replacing the port of Lumbo, 30 miles southward, terminus of another branch of the railway, the natural facilities of which were not good enough to justify carrying out important port improvements.

Nacala, the geographical situation of which is given by the co-ordinates latitude South 14°—32-ft., and 40°—40-ft. in longitude East of Greenwich, is at the end of a series of bays (Fig. 1) covering about 13 Kms. in length with an average width of 3.5 Kms. The Port is about half-a-mile from the open sea.

The Ports of Mozambique—continued

It is an excellent harbour and its sand and mud anchoring places are generally from 15 to 25 metres deep.

In the scheme, works have been envisaged, not only in order to serve the northern hinterland of Mozambique, but also to meet some part of the traffic of Nyassaland and Northern Rhodesia, whose natural outlet, in the near future, will probably be this port, when the Mozambique Railway has been extended to join the railway network of neighbouring territories at some point on the frontier between Mandimba and Mecanhelas, South of Lake Nyassa.

Congestion at the Port of Beira will thus be relieved, which is necessary in view of the great development of the Rhodesias.

It is possible that the great developments that have already been put in hand at Beira, and those planned for the immediate future, may not be sufficient to meet the traffic requirements of the neighbouring territories should full expectations be realised. But, as we have no guarantee as yet that, when the port is constructed at Nacala, we shall receive the traffic of non-Portuguese territories, we have divided its building into phases, considering particularly during its first phase the needs of the traffic that normally serves the northern coast of Mozambique and our own hinterland.

Once all the works are concluded, they will be able to serve the small coasting vessels not requiring more than 3 metres depth of water, as well as the big ships of 12 metres draught.

Therefore (Fig. 2) quays 3, 9, 10 and 12 m. deep, and having a total length of 1,460 m. have been planned. This extent is considered enough to deal with a traffic of 1,300,000 tons.

A width of 145 m. has been given to the platform of the quays and in the scheme a dry dock has been included 220 m. long and 33 m. wide (Fig. 2), with a sill of 10 m. below L.W.S.T.

The total length of the railways for the terminus station of the railway and platforms of the port is 28 kilometres.

Plans have been made for the construction of a dock 200 m. by 30 m. for coasting vessels, provided with a slipway. As a first phase, the building of the following works has been contemplated viz.:

(a) A 300 m. section of landing quay for ocean steamers with depths of 9 metres.
(b) A 200 m. section of landing quay for coasting vessels 3 m. deep at L.W.S.T.
(c) Three warehouses near the quay, having a total covered area of 5,400 square metres.
(d) A disinfection station.
(e) Railway tracks serving the landing quays.
(f) Reclamation for laying the Railway, and an avenue along the coast.
(g) Depots for wagons and motor coaches.
(h) Covered sheds for engines.
(i) Turning bridge for engines.
(j) Railway general warehouse.
(k) Electric power station.

The main quay wall (Fig. 3) is to be of a uniform type and made up of concrete blocks.

For the building of the foundations of this quay wall it has been estimated that it would be necessary to dredge the bottom to a depth where hard subsoil is found and to fill up the trench with rubble up to level—9.00 m.

Embedded 0.30 m. in the rubble will be set a reinforced concrete slab, 0.80 m. thick, with the top at a level—8.50 m.

On the above-mentioned slab will be laid the concrete blocks forming the quay wall made with a proportion of 280 kilos of cement per cubic metre of aggregate. Such blocks, of which there will be four in the height, will reach a level +1.00 m. and on them will be built the superstructure of the quay wall, composed of concrete, of 350 kilos of cement per cubic metre, cast in place, with the top at level +6.00 m. The blocks of the wall weighing from 65 to 78 tons, will be laid by a 80-ton floating crane or by a stage built on two barges.

The quay wall is to have a batter of 1:25, and it has been planned to place at the back of it a rubble mound up to a level of +1.00, covered with a layer of quarry chips and clay, 1 m. thick, for protection of the filling; in this way, the pressure on the quay wall would be considerably reduced and the foundation ground conveniently relieved of load.

The quay wall for coasting craft is to be founded at—3.00 m. and is of the same type, its length being 200 metres (Fig. 4). This wall will also be relieved by a rubble mound lined with argillaceous material.

GEOLOGICAL BORINGS AND INVESTIGATION OF THE LAND

Many geological borings were carried out in the port of Nacala, along the part of the shore which was considered to be the most suitable for the construction of deep water quays.

The borings were spread over an area of about 30 hectares, and some carried as far as 400 metres from the present coastline, presented considerable difficulties on account of the greater depth of water and the length of the borings. The sounding equipment was mounted on a barge.

From the examination of the samples collected and other facts recorded during the research work, which form the basis of the planning of the port and the scheme of maritime work, it has been ascertained that the subsoil of the bay under consideration, is composed of the two groups of quaternary formation, probably laid upon the cretaceous strata; which outcrops along the coast between the island of Mozambique and the bay of Port Amelia; and that their dispersion both vertically and horizontally was most irregular.

Due to such irregularity and abrupt changes in the structure of the formations in the subsoil and sometimes to their poor properties, a number of geological borings carried out alongside the original outlines of the scheme of works did not give the limits of such formations and otherwise proved inconclusive in their results. It was found convenient, therefore, to make new borings alongside revised quay lines recommended by the author of the scheme.

The formations met with in the geological survey which form the basis of the scheme of the future harbour were as follows:

(a) Pure sand, without mud or clay at the bottom of the bay, down to a level of—10.00 m., the sand formation being made up of fine grains of quartz containing small fragments of crushed shell.
(b) Muddy sand containing approximately 20 per cent. of mud representing the transitory state between the pure sand at the surface and the soft mud underlying. The thickness of such formation varying between 3 and 6 metres.
(c) Dark mud, very soft and sometimes slightly sandy.

This formation which, at certain points, reaches 15 metres in thickness, is likely to be the greatest hindrance to the construction of the works outlined, due to its lack of the physical-mechanical conditions necessary to sustain in a reliable manner, the pressure transmitted thereto by the intended constructions.

These three layers of recent sedimentation rest on an older argillaceous series, probably pleistocene, which is rather compact and hard and has a high degree of cohesion.

As the above-mentioned conditions were verified, a brigade of technical experts, headed by the engineer Henrique O'Donnell left for Mozambique in order to proceed with the further geological investigations needed so that the harbour works in Nacala Bay could be started as soon as possible, for they were considered by the Portuguese Administration as of great importance, which only the situation created by the last world war had delayed.

CARRIAGE OF EXPLOSIVES IN SHIPS.

Section II of Ministry of Transport Circular 1817 (T. 152), containing a classified list of Government explosives and indicating the stowage conditions required for each item in cargo ships, has been revised and a new list issued as Amendment No. 1 (amending Section II), Revised Classified List of Government Explosives (May, 1950). Copies may be obtained from His Majesty's Stationery Office or from any bookseller, price 4d. net.

Some Modern Cargo Handling Appliances

Review of Mechanical Equipment used in British Ports

By E. S. TOOTH.

(continued from page 97)

(4) TRANSPORTING AND PILING MACHINES

Some of the machines which have been introduced into port work were manufactured specifically for cargo handling; others have had to be adapted. The fork lift truck, the most controversial machine of all, and the subject of the third article of this series, is so far in neither of these categories. There is little doubt, however, that the persistent experiments which are being made with it at various ports will ultimately lead to its general introduction.

PLATFORM TRUCKS

The machines dealt with in the present article are mostly those which are " personal " to the workmen. Some carry the goods for the gang, some actually pile them. Nearly all of them are part of the permanent mechanical equipment of our ports and none is more firmly established than the electric platform truck.

Fig. 1.

The modern design of this machine is very efficient. It is a battery-driven vehicle easy to operate but requiring, of course, charging facilities on the premises. It is, in effect, a platform measuring approximately 8-ft. x 4-ft., mounted just over 2-ft. from ground level on four tyred wheels. It is very manœuvrable and usually capable of carrying a load of 2 tons at a speed of some 4 miles per hour. Sets of cargo landed in rope slings or on landing boards on to the platform of the truck can be quickly conveyed to the desired point. Some trucks have a central driving position; others an off-set driving position which allows long packages to extend forward as well as aft of the platform.

Some ports are equipped with electric tractors to do similar work. These machines are also battery-driven and can tow a number of loaded platform trailers carrying a total weight of 5 tons or more. They are most useful when long distances are involved, for not only is it possible for the tractor to tow loaded trailers, say, from ship side to piling ground or vice versa but, if necessary, those trailers can be left to be unloaded whilst other loaded trailers are being fetched by the same tractor.

The electric platform truck illustrated in Figure 1 is the " electric eel," so called because of its unusual method of steering. The makers, Steels Engineering Products, Ltd., claim that an outstanding feature of the truck is its ability to weave its way past obstructions and through narrow gangways by " instinctive " steering. The driver, standing on a laterally pivotted platform, steers by transferring his body-weight from one foot to the other in the direction of turn, whether driving with load trailing or leading. There are no pedals to operate—the feet never leave the platform. This truck, which is fitted with rubber-tyred wheels, has a capacity of 30-cwts., a speed, laden, of 6-7 miles an hour, a turning radius of about 9½-ft. and weighs 21-cwts.

When short trucking distances are involved, and the packages are " handable," a hand truck is often the most economical tool for moving them. When the packages are awkward, cumbersome or heavy, however, the electric truck is usually more satisfactory. " Wot's the job now?" ask the men. " Shift them empty bullocks," answers the ganger—and the gang brings its electric trucks to the pile of big, heavy and awkward bales of stiff dry hides. Such packages as these and crates of veneers, for instance, are much more easily handled on a mechanical truck.

THE HAND TRUCK

As indicated, however, with "simpler" packages, the hand truck (which, by the way, is now a tool of carefully calculated dimensions and ball bearing wheels) is still extremely useful in port work. It is sometimes implied by people keen on speeding up the work of cargo handling that the hand truck is almost obsolete, that it ought seldom to be seen in up-to-date ports. Port officials know, however, that in their industry more than in most others, one of the dangers to avoid is mechanising for the sake of mechanising In certain cases it is still possible for manual gangs to do work which compares favourably with that performed by gangs using mechanical appliances. Recently in one of our biggest ports, it was necessary to deliver from transit shed to barge 500 tons of cartons of canned goods temporarily landed into the shed ex a vessel from the United States of America. At the time of discharge, by the way, gravity rollers were used in the ship's hold.

The goods had been piled just inside the shed door and it was possible to place the barge opposite the doorway. The trucking distance involved was only a few yards. Arrangements were made for two wooden chutes to be placed so that the packages would slide down them from the quay level into the barge and the gang was supplied with a few hand trucks. The men at the pile loaded up the hand trucks and men at the top of the chutes slid the packages down to the two pairs of men in the barge. The output was an excellent one and there was obviously no need for the goods to be made up into sets on boards so that they could be lifted into the barge by one of the many high capacity quay cranes, there to be broken down into individual packages for stowing. It is interesting to add, however, that one of the officers of the American ship, noticing the job as he came down the gangway on to the quay, remarked, " Hullo, all your cranes broken down? " When the background of the job had been explained to him and it had been pointed out that speed was the order of the day—and was being obtained—he readily saw the point and described the operation as " cute."

THE CRANE TRUCK

It can never be over-emphasised that port work is of an extremely miscellaneous character and problems are always arising requiring, among other things, ingenuity and tenacity of purpose to solve them. New commodities and new packings arrive at the port without prior notice and ways and means must be found of dealing with them speedily.

In their efforts to assist to solve these ever-recurring problems,

Some Modern Cargo Handling Appliances—continued

certain manufacturers have produced dual-purpose machines. One example of this—the fork lift truck, which can be temporarily converted into a crane—has already been given. Another example is the crane truck, a battery-driven platform truck, fitted with a jib and designed so that the crane can lift and convey loads of up to 15 cwts. The machine operates as follows:—The truck is manœuvred to the load, the angle of the jib is set by hand control and the load lifted. Two metal runners are then thrust outwards from the truck platform so that they protrude underneath the load and the crane lowers the load so that it rests upon them. This enables the load to be carried without undue strain on the jib and hoisting rope. This machine is particularly useful in low pitched buildings.

HAND AND POWER-LIFT TRUCKS

Some packages, particularly some heavy ones, are of the type that, once placed on the shed floor, are difficult to pick up again. One means of making such cargo transportable is by placing it on a stoutly-made stillage board, which is in fact a platform on legs. A truck of special design is manœuvred so that its platform or chassis frame is placed underneath the loaded stillage board and then raised to lift the load a few inches off the ground for conveying.

One design of this machine is the hand lift truck, capacities of which range up to 5 tons. The load is hydraulically lifted by operating the truck steering handle as for a pump and is lowered at an adjustable speed usually by pressure on a pedal pad. The hand lift machine is extremely manœuvrable and is frequently used in export sheds. It cannot, of course, pile. In its power-driven equivalents, which include battery and petrol-driven trucks, the platform is raised by the truck engine.

A similar machine is the hand pallet truck. This is a manual truck which will transport a loaded pallet. It is fitted with "fingers" or forks on wheels which are designed to run under the single-faced pallet or between the faces of the double-faced pallet. The lift of some 4-in. is made by a hydraulic unit which is usually housed in a "body" at the front of the truck. The process of lifting simultaneously gives the load a backward tilt.

Battery-driven machines are made for the same purpose. They can travel both forward and reverse, being controlled and steered by the operating handle. Fork or fingers can be fitted to suit the dimensions of the pallets being used. The lift is hydraulically operated, usually by press-button control, but sometimes manually, and raises the load about 4-in. The capacity of these machines is about 2 tons. Both the hand and the powered pallet truck are, of course, constructed as complements of the fork lift truck. They are extremely useful in operations which do not involve tiering and are very handy for operating in confined spaces such as the inside of a railway wagon. They will probabaly play a more important part in port work when the general introduction of the "parent" machine takes place.

PILING MACHINES

At this point it may be of interest to follow a parcel from ship to warehouse and to note how many mechanical appliances are employed to handle it in the process of "finding a home" for it.

Take a parcel of, say, 200 tons of goods in sacks, each full bag weighing about 2-cwts. In our example the merchant has asked for the goods to be lightered to a suitable warehouse, which, as is quite usual, is not at the dock of discharge. The first handling is when the parcel is discharged from ship to barge by means of ship's gear or quay crane. At the Warehousing Dock it is landed in sets by mobile or quay crane on to electric platform trucks which convey it to the warehouse. Here the sets are lifted, probably by wall crane, which places them on the loophole flap or possibly direct on to the platform of a light electric truck, one make of which is the "electricar." By electric or hand truck, the goods are conveyed to the piling ground where they may be handled by yet another mechanical appliance, an electric piling machine. As will be seen, from the time of commencement of discharge to that of final housing, the parcel has been handled by four to six different machines.

A typical bag-piling machine is that illustrated in Figure 2. Made by Crone & Taylor, Ltd., of St. Helens, Lancs., it is of the portable conveyor type, is 35-ft. long, has belts 24-in. wide and a capacity of 60 tons per hour. Height adustment is by hydraulic jacks. The machine is petrol, diesel or electric driven, weighs 38-cwts. and can pile bags to a height of approximately 20-ft.

Stacking machines of the same type are made by the same firm in lengths varying from 15-ft. to 50-ft., with a corresponding range of maximum height of from 9-ft. 6-in. to 28-ft. 9-in. The smaller machines are frequently used for effecting deliveries to lorries but an example of the efficient use of 40-ft. and 50-ft. conveyors comes from a South Coast port where bagged goods are handled by these machines from ship side to warehouse. The dock crane delivers a ton of bags on to a platform erected alongside a 40-ft. horizontal conveyor. The bags are rolled on to the machine which delivers them without any further handling, to a 50-ft. stacker (or first on to another 40-ft. horizontal conveyor when piling is being done at the back of the warehouse). The 50-ft. stacker, the height of which is readily adjustable, delivers the bags to the men at the top of the pile, which can be built up to a height of 25-ft. Eight men in eight normal working hours receive and pile 260 tons of bags with the aid of these conveyors. The stacker, by the way, is reversible for delivery.

Fig. 2.

A particular need in British ports at the present time is to make the maximum use of space and attention has thus been paid to high piling. The mobile crane and the fork lift truck will perform this duty but most of the standard machines need a large amount of working space. Special duty mobile cranes have been introduced to overcome this difficulty but the least working space is still required by manual gangs, who frequently only need to leave gangways little wider than the width of a hand-truck or its load. The importance of aiming at having gangways 5-ft. wide instead of 15-ft. will readily be appreciated.

However, high piling by manual labour is arduous and expensive and Port Authorities are continually on the look out for means of mechanising this operation. One machine employed for this purpose is the "Eclipse" patent electric-hydraulic portable crane. Built on a chassis mounted on four wheels, it has a telescopic mast supporting a fixed horizontal jib. The load is suspended on a hoist chain, which first passes over a block at the lifting end of the jib and then runs through a system of pulleys at the mast end of the jib. By electric power supplied through a flexible cable, a self-contained hydraulic pump increases or decreases the height of the mast, thereby raising or lowering the horizontal jib. This action automatically takes in or pays out the hoisting chain through the pulleys, thereby raising or lowering the load—in most models at three times the speed of the jib. The jib and load are slewed in any direction, without the base moving, by turning a handle at the foot of the mast.

The advantages of this crane are that it can approach close to the piling ground and/or the vehicle to be served and needs the minimum working space. A typical job it is doing in one port is

Some Modern Cargo Handling Appliances—continued

stacking half-ton bales of skins 29-ft. high at a speed of lift of 65 feet per minute.

A machine used for piling wool is constructed on an entirely different principle. It is battery-driven and the chassis somewhat resembles that of the platform truck. It has four solid rubber-tyred wheels, two of which steer. The lifting apparatus consists of a pair of teethed metal jaws, fitted at the end of a cantilever jib. The operator dips the jib to ground level, causes the jaws to grip the bale and then raises the jib with the bale to the required height. The bigger machines have a capacity of 9 cwts. and can stack five bales high.

Bales of wool vary considerably in shape and those with rounded sides are naturally more difficult to pile quickly. A medium capacity machine can pile " square " bales, weighing about 3 cwts. each, at the rate of 800 to 1,000 bales per day. These machines, with their teeth removed, have also been employed for stacking other commodities, including bacon.

HEAVY DUTY TRACTORS

The big post-war increase in heavy and bulky packages has made the provision of certain machines essential, irrespective of whether they would have been introduced for increased speed, reduced manning or efficiency of handling. The heavy duty petrol-driven tractor is a case in point, although some ports have for many years held a small number of these machines for such " indirect " work as moving non self-propelling quay cranes

Like the electric tractor this machine can tow a number of trailers. Whereas, however, the former is mainly employed to tow loaded trailers comparatively short distances over hard, level surfaces, the heavy duty tractor can tow a number of big trailers, each with a load of as much as 3 tons, long distances over rough ground. It is, therefore, frequently employed in the housing of import goods is open storage space.

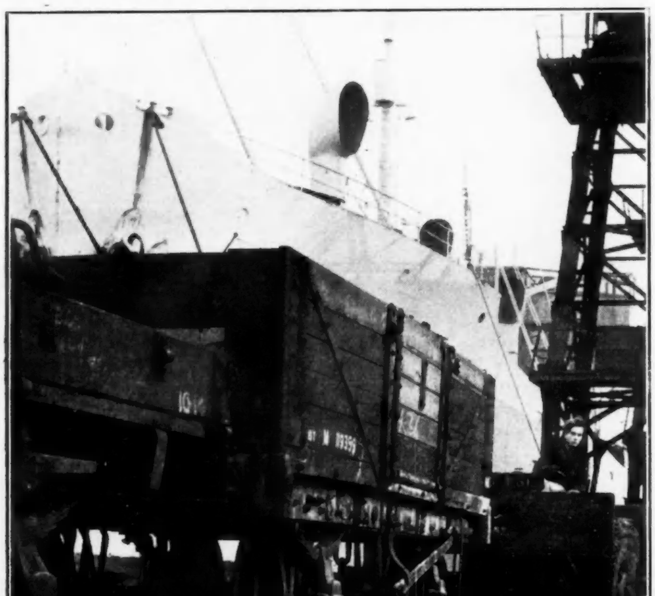


Fig. 3.

In an export department, one of the tractor's main duties is to tow to parking ground or from parking ground to ship's side, all types of vehicles on wheels. Another important use for it is to shunt railway wagons, and tractors required for this purpose are fitted with buffers.

The Chaseside Buffer Tractor (Figure 3) is one of the machines employed in the above-mentioned import and export work. It is normally supplied with a Fordson petrol engine, but a Diesel driven machine, the power unit of which is a Perkins P.6 engine, has recently beeen produced as an alternative.

The Chaseside petrol tractor was originally developed for railway shunting. Its advantage was that it was more mobile than a locomotive for a great number of shunting operations and it was consequently found to be speedier and more economic. On a straight level track the " standard " model, which has three forward gears and one reverse, is capable of shunting trucks of a total weight of between 100 and 120 tons. Its maximum speed is 8.85 miles per hour. Its four wheels are fitted with either solid or pneumatic tyres according to the type of ground upon which it is required to work. The model illustrated weighs approximately $2\frac{3}{4}$ tons, is 11-ft. 3-in. long, has a wheel base of 6-ft. 8-in. and a turning radius of 17-ft. 6-in. As will be seen, it has no driver's cab. Many drivers prefer unobstructed visibility rather than protection from the weather and machines are therefore supplied with or without cabs as desired.

This tractor is quite versatile and, as mentioned above, is also much employed with trailers to transport import and export goods. Here and there in British ports mechanical horses are employed for similar work.

In connection with the " general " machines described in this and preceding articles, it is of interest to note that at some ports existing premises are being altered, in order that the best use can be made of mobile cranes and fork lift trucks. Further, plans of new premises take into account that shed doorways must be higher and wider ; shed approaches must be suitable for mechanical appliances; loading banks, if installed—for they may not always be deemed necessary at sheds designed to accommodate mechanical equipment—must be wide enough for certain machines to operate on them; warehouse and shed floors must be strong enough to bear the weight of the new mobile cranes, fork lift trucks, etc. (and the high piles of goods they make possible) and their surfaces satisfactory for rapid and safe working. Final points are ventilation—which is important when diesel- or petrol-driven machines are to be employed—and fire prevention, which is also a controlling factor in the design of new premises. Unenclosed openings between floors assist fires to spread.

It is obvious, therefore, that the mechanising of port work is not just a matter of introducing cargo handling machines to do jobs hitherto performed by hand. It goes much deeper than that. In the first stage, the machines have got to be of the type and design suitable for existing premises. Then there have to be special arrangements for fuelling and maintenance. Mobile cranes, for instance, have to be overhauled at regular intervals and need garage space, workshops and engineering staff. Another important need is to obtain the co-operation of the dock workers—who frequently regard new machines as a mixed blessing. The recent Report by the Working Party on Increased Mechanisation in the United Kingdom Ports emphasised that there is an inherent fear among the workpeople and their representatives that the use of machinery is aimed directly, if not exclusively, at them.

Finally then, when the port has been equipped with machines, expert drivers, fuelling facilities, charging stations, garages, workshops and engineering staff, it will continually be found that certain alterations to premises—wider doors, higher roofs, stronger floors, a ramp here and a hard, level surface there—will be necessary if the fullest use of the new equipment is to be obtained. Speed with safety is the order of the day and the latest types of machines to obtain it are being rapidly introduced into British Ports, despite the scarcity of certain raw materials, despite difficulties due to the design of premises constructed before certain modern machines were invented, and despite (and also because of) the present export drive, for it is still necessary to export so many units of modern mechanical equipment that, in some cases, home demands cannot yet be fully met without a considerable time-lag.

The next article of this series will deal with special purpose machines—grain handling equipment, conveyors, overhead cranes, " straddle " carriers, rail-mounted cranes—some of which are to a certain extent conditioned by the premises in which they have to be used.

Rehabilitating Philippine Ports

By LT.-COL. JOHN SHAPLAND

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The young, insular Republic of the Philippines depends for its cargo transportation almost entirely upon inter-island and international ocean shipping. During World War II, many of the port facilities vital to this commerce were severely damaged by demolition charges, torpedoes, bombing, shellfire, or exploding stored ammunition. Lack of maintenance during the Japanese occupation also contributed greatly to the deteriorated condition of the port facilities.

Foreseeing a need for assisting the Filipinos in their reconstruction programme, the President of the United States directed the Secretary of War to have the Corps of Engineers make a study of requirements for rehabilitation and expansion of port and harbour facilities in the Philippines. The outcome of this study was a report officially titled "Report on Port Facilities, Philippine Islands," by Colonel C. L. Hall.

Based on the Hall Report, legislation was included in Public Law No. 370 of the 79th Congress, known as the "Philippine Rehabilitation Act of 1946." This act was approved by the President on April 30, 1946, since when a total of $17,800,000 has been made available for port and harbour rehabilitation.

In order to implement liaison and planning for port rehabilitation within the Philippine Government, the President of the Republic of the Philippines appointed the Philippine Port Commission, which was later authorised to consult directly with the Manila District. After establishing mutually acceptable liaison procedures with the Manila District, the Port Commission drew up a construction programme. Meanwhile the Manila District assisted by assembling data, and by making preliminary designs and cost estimates. Upon approval of the programme by the Philippine Executive Office, detailed surveys and plans for the ports in the programme were initiated. Although changes have been made from time to time, the programme is now well established and moving toward completion.

MANILA.

The port of Manila, one of the finest ports in the Orient, and by far the most important port in the Philippines, consists in reality of two ports: South Harbour, used by most international shipping, and North Harbour, a shallower port north of the Pasig River, used mostly by coastwise ships. Damage to both North and South Harbours was enormous; the large piers, one over 1,400 feet long, were bombed, whole palens of concrete deck together with their supports were demolished by the Japanese, concrete whalf bulkheads were blown in to land LST's, and the harbour was littered with sunken ships. The Army and Navy raised many wrecks, did some essential dredging, and repaired the damaged piers and built new piers. The repairs and new piers, however, being temporary in nature, were deteriorating rapidly. In keeping with Manila's status as the Philippines' primary port and with the extent of damage to it, the greatest part of available port rehabilitation funds is being spent here.

In Manila North Harbour, breakwater construction was interrupted by the war. A 2,500-foot extension to the existing breakwater has been built and a further 1,000-foot extension is nearing completion. Nearly 250,000 tons of rock for these breakwater extensions were quarried at Mariveles on Bataan Peninsula and barged to the site. The tie rods from the partially completed Piers 12 and 14 were removed during the war. These were replaced by steel wire rope installed by hired labour. In addition to repairing breaks in the concrete and sheet-piled bulkhead wall, new walls were constructed at the base of Slip O and between Piers 4 and 6. The fenders and dolphin clusters were also largely replaced. The principal streets in North Harbour were paved with asphalt. In all, the work at North Harbour, now substantially complete, will cost about $2,440,000.

*Excerpts from details supplied by the United States Information Service, Manila.

At Manila South Harbour, an estimated $7,700,000 will be spent for the rehabilitation of port facilities. Already completed are concrete pavements on the principal streets and a reinforced concrete scalehouse. Over two-thirds finished is an enlarged, $5,500,000 Pier 9, 331 by 987 feet. This pier will have a depressed centre roadway with two warehouses on each side. The deck is of beam and girder construction supported on concrete pedestals built in open caissons. Pier 9 is scheduled for completion early in 1950.

Pier 13, was, before the war, when it was called Pier 7, the most handsome of Manila's piers. Over a quarter of a mile long, it had two levels in its reinforced concrete and steel superstructure, with an imposing concrete arch entrance. The superstructure, severely damaged, is being removed, to be replaced by less imposing but more efficient concrete-walled warehouses. Large breaches in the deck will be repaired by supporting new panels of concrete deck on concrete-jacketed steel H-piles, which will replace the most seriously damaged of the original concrete piles. The fender system will be replaced, and the underside of the deck, deteriorated until the reinforcing is exposed in many places, will be repaired with pneumatically placed concrete. The water and electrical systems will be replaced. A contract for $988,500 has recently been signed for the rehabilitation of this pier.

CEBU.

Cebu is the second port of the Philippines in importance. The piers and the warehouses on them were heavily damaged, primarily by gun-fire. Temporary repairs were made by the Army, and most wrecks which were a hazard to navigation were removed by the Navy. Reconstruction of the three main piers, on two of which warehouses are located, and the marginal wharf is under way. While the total cost of Cebu port rehabilitation will approximate $900,000, only about half of this amount is for structural repairs to the piers and quay wall; the remainder is for repairing warehouses, replacing dolphin piles, and miscellaneous repairs to the electrical and water systems.

ILOILO.

Iloilo, the Philippines' third port, is the outlet for a rich agricultural area. The deep-water Guimaras Wharf and its warehouse suffered extensive damage from Japanese bombing. Manganese ore had been piled around some of the warehouse columns and corroded the steel extensively. In addition, an earthquake which occurred after the signing of a contract for repair of the wharf further damaged the one remaining warehouse end wall. Damage to other parts of the port was not great. In size and in the type of work involved, this project is typical of the rehabilitation being done to pier and wharf facilities.

The rehabilitation of Guimaras Wharf required first the clearing of a tangled mass of debris, then the driving of 13 new 22-in. × 22-in. and 20 new 20-in. × 20-in. reinforced concrete piles averaging about 70 feet in length. To take advantage of usable existing concrete piles, 53 of them were demolished to below the lowest damage, provided with new reinforcement spliced on by lapping or welding, and rebuilt up to deck level. After new piles were driven and existing piles repaired, a new concrete beam and deck system was poured in the demolished area.

Cast monolithically with the reconstructed portion of the deck are new foundations for the warehouse, originally a structural steel frame with reinforced concrete end walls, the whole covered with galvanised iron sheets. Before the war the warehouse had longitudinal crane rails suspended from the roof trusses. In the rehabilitation, the crane rails were removed, all usable structural steel repaired and repainted, and both concrete end walls rebuilt. New structural steel will be erected as required and the entire warehouse covered with protected metal roofing and pierced plank landing mat siding.

The floor of the warehouse is being paved with asphalt. A new concrete bulkhead wall is being built on wood piles in the demolished area. Defective and missing dolphin piles and walls are to be replaced, and the electrical, railroad, mooring and water systems are to be repaired or re-installed as necessary.

While the material quantities required are not large, the job is complicated by the variety of work involved and by the continuous use of the more lightly damaged part of the wharf by shipping. The present contract is for about $275,000 and the work is about two-

Rehabilitating Philippine Ports—continued

thirds complete. The total cost of the work, including preliminary work, government-furnished materials and government costs, will be about $407,000.

DAVAO.

A centre of Japanese activity before the war, Davao is fourth in importance of Philippine ports. The government port facilities suffered minor damage but extensive deterioration during the war. However, many privately owned piers were damaged or destroyed, resulting in a great decrease in port capacity. Because of shoaling in the old harbour, a new 500-ft. long marginal wharf was built on a coral shelf along Pakiputan Strait, near Sasa, six miles from Davao. At the new location, sufficient depth of water can be maintained without the annual dredging required in the old harbour. This facility was completed in March, 1949, at a total cost of about $345,000.

OTHER PORTS.

Other smaller Philippine ports suffered damage of varying degrees. Many of these are under rehabilitation at the present time. At Nasugbu, about 20 miles south of Corregidor, a 330-ft. rock breakwater was recently completed. Complete replacement of the concrete wharf deck and some pile and causeway work is nearing completion at Tabaco. Although Tabaco was only slightly damaged during the war, waves during a typhoon removed most of the deck a short time later and enlarged the damaged area considerably. The wharf at Masbate was damaged by a torpedo, and is being partially replaced. Two breaks in the long concrete-pile causeway of the pier at the sugar port of Pulupandan have been repaired and new dolphin piles driven.

Further south, the wharf at the important inter-island port of Cagayan was largely destroyed, partly by demolition charges but largely by the explosion of a large quantity of Japanese ammunition stored on the wharf. The concrete deck and about three-fourths of the piles are being replaced. At Iligan, damage resulted partly from demolition charges placed on the concrete piles, but largely from deterioration of the concrete deck of one of the two piers and of the dolphin piles. The rehabilitation of one pier has been completed; work on the other is nearly complete. Repairs at Zamboanga and Jolo are under way. In all, rehabilitation of these smaller ports will cost about $1,460,000.

In addition to the repair and reconstruction of port and harbour facilities outlined above, most of which was done or is being done by the Manila District by contract, about $3,960,000 worth of floating equipment has been or will be given to the Philippine Government. The 720 cubic yard, sea-going hopper dredge, "Barth," was transferred to the Philippine Bureau of Public Works in October, 1947, and has seen extensive use in maintaining project harbour depths. A crew for the 20-inch pipeline dredge, "Sacramento," was trained, and the dredge was transferred to the Bureau of Public Works in June, 1948. A 60-ton revolving barge crane was assembled by the District and formally given to the Philippines in September, 1948. In addition, three shallow-draft, three-quarter yard dipper dredgers for maintenance work were recently procured by the Philadelphia District.

Certain projects have been authorised for planning but not for construction by the Corps of Engineers. Reconnaissance surveys to determine the extent of damage have been completed, and preparation of drawing and specifications for these projects is nearly complete. Some of these ports were surveyed as part of the originally-planned programme and then deleted from those authorised for construction; others were surveyed and plans and specifications are being prepared for use of the Philippine Bureau of Public Works. Projects included in these categories are mostly those of lesser importance of ports which were not damaged extensively during the war. The total cost of these surveys and the preparation of plans and specifications for these projects will be approximately $50,000.

It would be difficult for a person who had not lived in the Philippines to realise some of the problems of port and harbour rehabilitation. One of these problems is communication. The average air-line distance from Manila to the active projects outside Manila is about 375 miles. Davao is over 600 miles from Manila by air; about 1,000 miles by ship. Commercial air transportation service is good and is used extensively, both for personnel and for twice-weekly shipments of correspondence by air freight. Still, overland transportation for distances up to 60 miles, over rough roads, is required to reach a few of the projects sometimes accompanied by fording streams around washed-out bridges. Telegrams often require over 24 hours for delivery. But even more important than the difficulties of communication are shortages of materials sources and equipment, and of contractors experience in stateside construction standards and methods.

Suitable materials are often difficult to obtain. The combined field services of a geologist and a materials engineer were required in locating suitable aggregate sources for some projects. Reinforcing steel is frequently not available in the Philippines in the sizes, types and quantities required. Most structural steel for port projects is fabricated in the United States. Long wood piles are difficult to obtain, and creosoted piles over 95 feet long must be imported or spliced on the job. In addition, port and harbour rehabilitation is but a small part of Philippine rehabilitation, public and private, as a whole. As a consequence, competition among contractors for the available materials is brisk.

Contractors in the Philippines at the end of the war had little or no equipment. They have made up much of this deficiency by buying surplus Army and Navy equipment left in the Philippines. Much of this equipment is far from new, much of it is not ideally suited to the work to be done, but on the whole it is proving a great help.

Even the equipment now available is not used to the extent it would be in the United States; much of the work is done by hand. Often concrete is demolished with hammers and chisels, and reinforcing steel cut with hacksaws. Concrete may be poured from small two-man boxes or buckets. Aggregates have been washed by hand in mortar troughs on the job. Often cranes of capacity adequate for handling concrete piles are not readily available.

The equipment situation and construction methods, however, are constantly improving. Recently one contractor acquired a concrete pumping machine, and other contractors have begun to use pneumatic-tyred concrete buggies. Some contractors have creditable job-made hopper batch plants, and some of the larger projects have modern weighing hopper batchers. As the programme progresses, inspections of construction methods and results are showing evidence of steady improvement.

The port and harbour rehabilitation programme is well under way. Nine usable port and harbour facilities have been turned over to the Philippine Government, and three more are nearing completion. Three large pieces of floating plant are being used by the Philippine Bureau of Public Works. About eight other major projects are under way. Completion of the reconstruction of Pier 13 in Manila, scheduled for September, 1950, should bring the programme to a successful completion.

NEW PORT OF PARIS OPENED.

A new port of Paris, which will eventually cover an area of nearly 1,000 acres, with a total length of seven miles of quays, was officially opened early last month. At the opening ceremony, which was attended by the French Minister of Commerce and Industry, river traffic entered No. 1 dock for the first time. This dock, which so far is the only one completed, is intended for import and export traffic under customs control. It is equipped with 3-ton electric cranes and a 50-ton weighbridge for lorries, and can handle eight of the big Seine barges at a time.

The new port, constructed on waste ground in the loop of the River Seine downstream from the City, will eventually have six docks. One other dock has already been excavated. Sea-going vessels, drawing up to 15-ft. and of up to 1,500 tons, will be able to use the new port when the channel in the lower Seine has been deepened, and the bridges which were destroyed during the war have been rebuilt to give a 23-ft. clearance. Two nearby railways link the port area with the northern and western regions of the French railway system. Nearly three million tons of goods arrived at or left Paris by the Seine in the last quarter of 1949. The new port will allow traffic between the Marne and the lower Seine to cut the journey by 22 miles and avoid one lock and about 40 bridges.

A New Dredge for Abadan

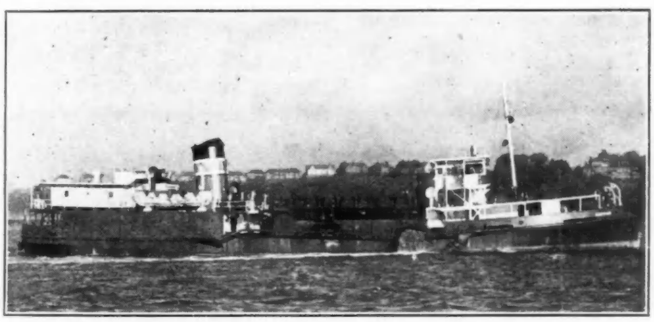
Improving Accommodation at Jetties

To meet the growing world demand for oil, the Anglo-Iranian Oil Company agreed that the number of tankers visiting and clearing the Port of Abadan would have to be increased. It was therefore decided that something would have to be done to maintain reasonable depth of water at all states of the tide at the loading jetties at the port. Hitherto, this maintenance dredging has been done by pontoon mounted Grab cranes, which take about three weeks to clean a jetty. It was realised that, if additional tankers were to be loaded, this time would have to be considerably reduced, and after careful investigation, it was decided that a Suction Dredge would be the best type of tool to undertake the work.

Accordingly, an order was placed for a new dredge—named "Haffar" which is Arabic for excavator — which was to be specially built for this work. The "Haffar" is a 20-in. bore twin-screw, twin-side, trailing suction hopper dredge, the main characteristics being:

Length B.P.	190 feet
Breadth moulded ...	40 feet
Depth moulded	18 feet
Hopper Capacity ...	875 cub. yds. (1,035 tons)
Dredging Depth	42 feet
Loaded Speed	10 knots

In the construction of the vessel welding is used extensively and from the illustration a good idea will be obtained of the design adopted. It will be seen that the bridge is arranged forward and the main accommodation aft. The officers' and crew's accommodation complies with latest maritime regulations and give good living conditions under the climate experienced at Abadan.



The machinery installation is divided into two sections—the boiler room and propelling engine room aft of the hopper and the main dredging engines and pumps forward of the hopper.

For propulsion duties two sets of triple expansion steam engines are fitted, each set being capable of developing 500 I.H.P. when supplied with steam at 180 lbs.—square inch (50° Superheat) and running at 170 r.p.m. Under these conditions the vessel on trials had a loaded speed of over 10 knots.

The electric generating plant, which is fitted in the engine room, consists of two (one working, one standby) 60 K.W. steam-driven generators while a 40 K.W. diesel-driven generator is fitted for harbour duty when steam is not available. The reason for the high electrical output is that all deck machinery is electrically operated and with the diesel standby set it can be used if necessary when the vessel is under repair.

To supply the steam load necessary, two Scotch Marine cylindrical boilers are installed, arranged to burn oil fuel under forced draught conditions. Each boiler has three furnaces and the total evaporation is such that full power requirements can be met without forcing the boilers.

The main dredging engines comprise two sets of triple expansion steam engines exactly the same as the propelling engines except that no reversing gear is fitted as the engines run in one direction only. (This arrangement simplifies the number of spares to be carried.) Each engine is coupled to a 20-in. bore sandpump which is so fitted that it can suck from the bottom of the river via the overboard suction pipes or from the hopper and discharge into the hopper or overboard to a pipeline for reclamation.

Each overboard suction pipe is hinged by means of a ball and socket joint fitted high up on the shipside so that it is just above the water line with vessel in loaded condition. The suction pipe which is all welded and specially stiffened is suspended at the aft end by a rope led to the hoist winch which is electrically operated. At the lower end of the pipe a suction mouthpiece is fitted suitable for working in reasonably soft material. Alternative designs of suction heads are supplied to allow the dredge to operate in hard material.

On the discharge side each pump delivers into a common main leading to the hopper or overboard.

The hopper is situated midships and has a capacity of 875 cubic yards or 1,035 tons. In cross section it is shaped like a "W" but it is not fitted with bottom doors for dumping dredged material at sea. Instead, at the bottom of each "V" a suction passage is arranged fitted with doors on top which can be lowered or raised by means of a hand winch arranged on the hopper walkway. This suction passage, as it is called, is connected to the suction side of the sandpumps. A cross connection is arranged between the passages. A diluting system is fitted in the hopper to assist the removal of the material when pumping it to reclamation.

In operation the vessel manœuvres into position as close as possible to the jetty face and the dredgemaster then lowers the suction pipes (which are protected by a tubular sponson which gives the ship a rather quaint appearance) until the suction mouthpiece is under the water. The pumping engines are then started and the sandpumps primed, taking care that the sluice valves on the discharge side are in such positions that the sandpumps discharge overboard. When they have been primed the dredgemaster proceeds to lower the suction pipes until they touch the bottom (when this point is reached it is obvious from the colour of the mixture being pumped and the vacuum gauge in the control room) and when the mixture is such that a reasonable proportion of sand and silt is being pumped, the discharge is switched to the hopper.

Thereafter the dredgemaster can raise or lower the suction pipes as necessary by watching the vacuum gauge in the control house. While the suction pipes are on the bottom the dredge steams slowly ahead thus trailing the pipes over the ground, removing the unwanted silt and sand. The surplus water pumped into the hopper is led away over the hopper weir and a deck hand can keep a check on the amount of spoil deposited in the hopper by sounding the hopper with a graduated depth stick.

Once the hopper is loaded, and this can be determined by reading the draught marks, pumping is discontinued and the suction pipes raised. The dredge then steams to the off-loading jetty.

At the jetty the overboard connection is coupled to the shore pipeline and then the sea inlet valves to suction passages opened. The pumping engines are then started and water pumped through the pipeline. The hopper diluting system is also started up and the suction passage doors adjacent to the sea inlet are opened slightly, thus allowing a certain amount of spoil to mix with the water in the suction passage. Pumping is continued and the suction passage doors opened further until there is no material on top of the area covered by these doors. Thereafter the next suction doors are opened until they are clear of material and the process repeated until the entire material in the hopper is discharged ashore.

By pumping the dredged material to reclamation marshy and low-lying ground can be reclaimed — and this is important at Abadan, as the ground now being reclaimed will be used to house future extensions to the present installation.

The "Haffar" was designed and built to Lloyd's Rules, Class 100 A1, by Messrs. Lobnitz and Company, Limited, of Renfrew, Scotland, and construction was supervised by the Marine and Engineering Superintendents of the British Tanker Company.

Ocean Terminal, Southampton Docks

Technical Description of New Building

A NEW OCEAN TERMINAL for the reception of Overseas visitors was opened at Southampton on July 31, by the Prime Minister, the Right Hon. Clement Attlee, M.P. The most modern building of its kind, the new terminal is nearly $\frac{1}{4}$ mile long and occupies almost the entire length of the East side of the Ocean Dock, where accommodation is provided for the world's largest liners.

The new terminal is a two-storey building, is which passengers will disembark direct on to a balcony at first floor level and then pass through large waiting rooms into halls where Customs examination and Immigration formalities will be completed. They will then descend by escalators to the ground floor where the boat trains for London, or their cars, will be awaiting them. The waiting rooms are situated in the middle of the building and the Customs examination halls at either end. There is also a sightseer's balcony on top of the building.

TECHNICAL DESCRIPTION

The overall length of the building, excluding the semi-circular feature at the South end, is 1,272-ft. 6-in., the width over the outside walls is 111-ft. 6-in. at ground level and 94-ft. 6-in. at first floor level, and the general height from quay level to the main ridge is 53-ft. 7-in.

The great length of the building compared with its height made architectural treatment a difficult problem, but advantage was taken of the fact that the first view of the buildng gained by passengers on incoming ships, is the view of the South end, and this was accordingly emphasised by the incorporation of the semi-circular feature, to which reference has already been made, the total height of which to the top of the flag staff is 110-ft. 6-in., which thus bears a reasonable proportion to the visible width.

Over the centre portion of the length of the building on the quay side, which is that part of the building immediately in view of ships' passengers after the ship has berth, the functional separation of the waiting rooms for the Customs halls was emphasised in the architectural treatment by the construction of an enclosed verandah at first and second floor levels, whereby the whole of this length of the building was brought forward so as to stand out from the remainder.

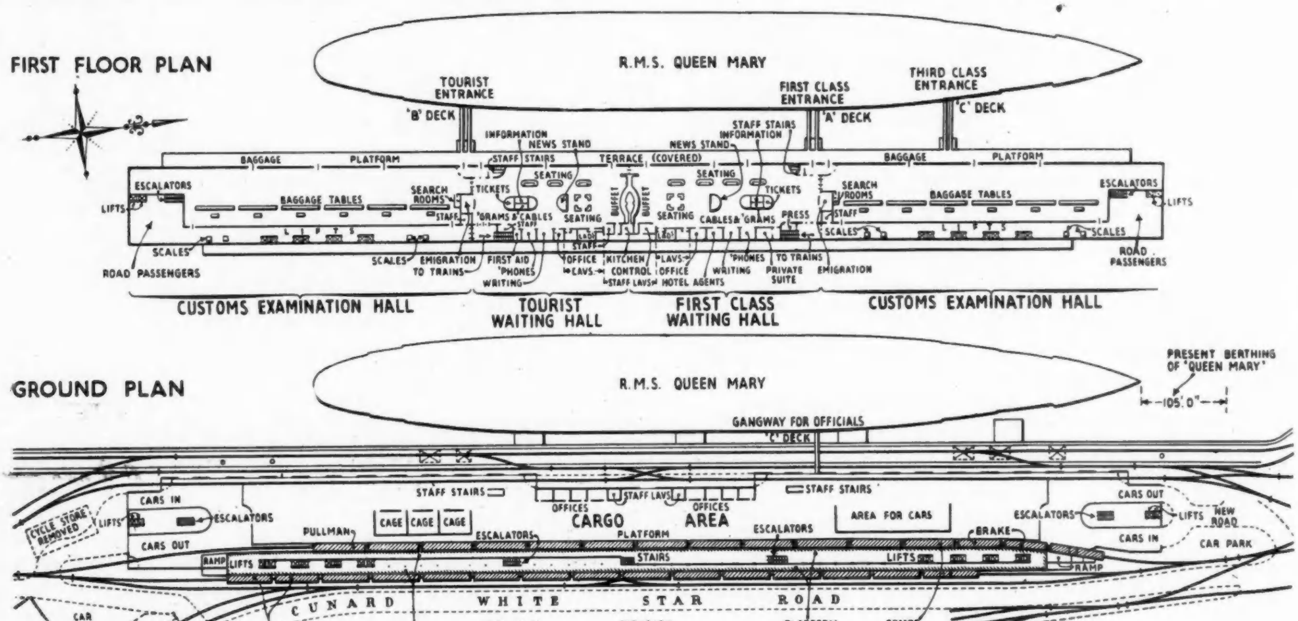
The terminal is a steel-framed structure supported on piled foundations driven on the Rotinoff patent piling system, the majority of the piles penetrating about 35-ft. below ground level, where they rest on a bed of ballast overlying green sand. A certain number of individual piles struck soft spots in the formation and penetrated deeper than this, one reaching to 70-ft. below ground level. A total of 433 piles of $17\frac{1}{2}$-in. diameter and 195 piles of 20-in. diameter were driven for the support of the building and the adjacent Transformer House.

The steel framework is disposed in a series of cross-sectional frames spaced at 20-ft. 2-in. throughout the length of the structure. The ground floor storey is of orthodox beam and column construction. At the centre of the building on the West side a longitudinal plate girder 6-ft. 3-in. deep and continuous over three spans of 80-ft. 8-in., 100-ft. 10-in. and 80-ft. 8-in. respectively, carries the external balcony over the scissors crossing whereby intermediate rail connection is provided between the rail tracks inside and outside the building. To allow the necessary clearances, the intermediate supporting columns which divide this girder into the spans mentioned above had to be formed of 9-in. diameter solid steel shafts to achieve the necessary slenderness.

On the first floor, freedom from intermediate structural columns is obtained, the building from this level upwards being designed as a two-pin continuous portal frame, springing from rocker bearings at first floor level. The leading dimensions of the portal are:

Span, centre to centre of rockers	...	91-ft. $7\frac{1}{4}$-in.
Height, rockers to outside of hip	...	16-ft. $2\frac{3}{4}$-in.
Rise, hip to ridge	... ...	15-ft. $2\frac{5}{8}$-in.

With the exception of three rivetted and bolted site erection



Floor plans, as prepared in 1946, showing arrangement of facilities, which have subsequently been slightly modified to include the semi-circular feature at the south end, as will be seen from the illustration following.

Ocean Terminal, Southampton Docks—continued

General View of the New Terminal.

joints the portal frames are in continuous welded construction, the ruling section being formed of one 24-in. x 7½ R.S.J. with the addition of flange plates of varying width and thickness according to the incidence of loading.

The stormwater disposal system is wholly concealed from the external view of the building. The construction of the island platform is by pre-cast concrete units of standard railway manufacture.

A large proportion of the wall area is taken up by windows, sliding doors or roller shutters. The balance of the walling is constructed in pre-cast concrete slabs of a general thickness of 4-in. faced on the outside with a composition of fine Portland stone aggregate. A large number of special blocks for pilasters, entrance quoins, etc. were required. An inner wall of 4-in. " Lignacite " building blocks separated by a 2-in. cavity from the outer skin already described, is secured to the latter at intervals by galvanised steel wall ties.

Suspended upper floors throughout the building are constructed in pre-cast reinforced concrete hollow " Bison " flooring units, supported on shelf angles attached to the webs of the main and secondary R.S.J. floor beams, a method of construction which achieved considerable economy in shuttering and also facilitated a very rapid completion of the first floor, thereby providing a valuable addition to the very restricted working space at an early stage in the job. The floors which are surfaced in granolithic, are designed to carry a superimposed loading of 200 lbs. to the square foot in the Customs halls, with an allowance for point loads arising from loaded luggage trucks, and 100 lbs. to the square foot in the waiting halls. For these loadings 6-in. deep " Bison " units of an average span of 9-ft. 3-in. were used throughout, the difference in the loading being accommodated by adjustments of the amount of reinforcement.

The windows generally throughout the building are of pressed steel welded construction, galvanised after manufacture. The pitched roof is covered with abestos cement combined sheeting, giving two thicknesses of material with a flat surface to the soffit and a ribbed finish externally. Aluminium glazing bars have been used for the long runs of glazing in the roof.

On the East side of the ground floor the outermost line of columns runs the length of a double sided island platform capable of accommodating two boat trains simultaneously. In order to minimise the obstruction on the platform arising from the structure of the building itself, the closing of this wall, when the building is not in use, is effected by a bank of 37 roller shutters, each 17-ft. 2-in. wide, supplied by Messrs. John Booth & Sons (Bolton) Ltd. The operation of these shutters is unique and is by mobile operating units. This is done by means of a flexible shaft gear unit driven by electric motor through the medium of a fluid coupling, for connecting to electrical power points through a 6-pin detachable plug member and four-cored flexible electrical cable, housed on a steel winding cable drum.

The Eastern side of the platform is covered by a reinforced concrete canopy 1,058-ft. 8-in. long, projecting 11-ft. from the side of the building, with 1,150-ft. 9-in. diameter glass lenses cast into the 4-in. thickness of the barrel.

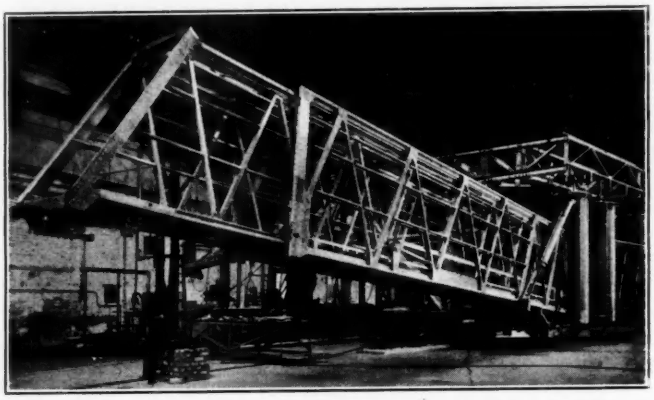
Cast in-situ reinforced concrete enters into the structure at many other points, particularly for the support of window and door lintels and sills on the upper floors, and a feature of the terminal is the reinforced concrete sightseers' balcony, 18-ft. 6-in. above the first floor level. This balcony is constructed of a 4½-in. thick reinforced concrete slab supported on three longitudinal reinforced concrete beams spanning between the main frames of the building. One of these beams, along the back edge of the balcony, is formed above and not below the slab, and becomes the plinth of the parapet wall at the back of the balcony. For some 480 feet in the centre of the building the balcony is widened outwards in two successive stages, the extension being carried by reinforced concrete cantilevers anchored back to the parapet beam or to the main steel framework. This widening enables the balcony to accommodate the enclosed verandah, and for the construction of

Ocean Terminal, Southampton Docks—continued

which the columns, which form the similar enclosure on the first floor balcony below, are carried up to a distance of 32-ft. above the upper balcony level.

Two expansion joints are provided in the length of the building, one at each of the junctions between the waiting halls and the Customs halls. At each end of these joints the main cross sectional frame is "afloat" longitudinally, expansion taking place into it from both sides by means of slotted end connections in the floor beams, purlins, etc. Bronze sliding plates cover the joints in the concrete floors and flexible copper strips those in the pre-cast block walls. Aluminium cover plates perform a similar function in roof glazing.

Access to the upper balcony is by means of an overhead corridor passing through the slope of the roof above the division formed between the first and cabin class waiting halls. On the East side of the building this corridor connects with a 69-ft. span pre-stressed concrete footbridge, which is supported at its outer end on a separate building incorporating access stairs and the Transformer House in which is accommodated the main sub-station equipment supplying power to the building. The bridge is on a slope of one in nine.



Inner and Outer Gangways, showing construction before sheeting.

The two 6-ft. 6-in. deep main beams were pre-cast in sections, each beam being composed of a series of panels and posts through which run the five pre-stressing cables, each consisting of twelve 0.2-in. diameter high tensile steel wires surrounding a mild steel helix. The beams are interconnected below floor level by screwed steel tie bars running through pre-cast concrete stretchers, and overhead by curved pre-cast concrete transverse roof beams spanning between the tops of the posts.

Pre-cast concrete stringers connect the tops of the posts in a longitudinal direction, and the posts, roof beams and stringers are held together by a single post-tensioned cable passing through them. The stringers have an eaves gutter formed in the upper surface and also function as lintels to the window openings below them, of which the top flange of the main beams form the sills, and the posts the reveals. Pressed steel window frames are set in these openings and curved asbestos cement sheets form the roof. The floor is of hollow "Bison" pre-cast units laid on the bottom flanges of the main beams.

Pre-stressing and anchoring of the cables were carried out at ground level on the Freyssinet system, the cables then being grouted up throughout their lengths and the completed beams lifted into position by two 15-ton railway cranes.

In the Customs halls the internal finish is obtained by painting the surfaces of the structural members and cladding. In the waiting rooms extensive use is made of veneered panelling and a suspended ceiling of fibrous plaster conceals the roof members. Ornamental laylights in the centre of the ceiling admit the illumination from the skylight in the outer roof, and artificial illumination is provided by fluorescent tubes concealed in cornice troughs formed in the ceiling itself.

The void enclosed between the ceiling and the roof serves to accommodate the ducts for the electrically-operated system of heating and ventilating provided in the waiting rooms. This provides at will for the re-circulation and warming of the air in the waiting rooms and its removal and replacement by fresh air as necessary.

The Telescopic Gangways

An interesting feature on the Western side of the terminal is the three twin-gangway telescopic assemblies which travel on rails in the first floor balcony. The normal type of gangway, which would need to be lifted into position by crane, was not considered a suitable proposition, particularly during high winds, and the solution was sought in gangways that could be extended mechanically to join ship and shore and provide fully enclosed passengerways for the comfort and convenience of the travellers. Three complete units have been constructed, consisting of shore stations each with two telescopic gangways which can be slewed, luffed, extended and telescoped.

To accommodate various ships the gangways must also move along the quay to the correct positions opposite the ship's entry doorways and the extensible walkways must not only move upwards and downwards to suit tide level but also rotate sideways to meet fore and aft movement of the berthed ships and also when not required, the walkways must swing back parallel to the dock and be clear of the cargo crane operation.

To serve all classes of passengers, three gangways were required, each having two telescopic walkways, one for ingoing and the other for outgoing traffic.

SPECIFICATION.

The specification called for a load of 200 lb. per foot of runway, and for wind loading up to 50 m.p.h. winds. As the extended end of the walkways cantilever out 75-ft. clear of the outer supporting rail, it will be appreciated that considerable forces have to be taken by the mounting turrets, the shore structure and the operating gear.

Aluminium alloy was chosen for the structural material in order to minimise the load on the shore structure and to reduce the size of the operating mechanism, which otherwise threatened to make the whole unwieldy.

Electric motors, picking up power from a trailing cable with automatic over-extension cut-out, drive the main road wheels through mechanical reduction gearing. The luffing and slewing of the gangways is by means of electro-hydraulic power and the telescoping motion is electro-mechanical through gear boxes and roller chains.

CONSTRUCTION OF GANGWAYS.

The first features of the structure to be settled concerned the telescopic gangways themselves, the weight of which conditioned the loads which would have to be handled by the operating gear and the shore structure. Stiffness and lightness in weight were essential. A pair of special extrusions form together to make a box construction at the corners, and afford a pleasing exterior shape and ease of attachment of the covering sheets. The side frames are Warren girders consisting of these boxes previously mentioned, joined together by diagonal bracing. For lightness and rigidity the floor has been made by means of sandwiching corrugated sheeting between two flat aluminium alloy sheets top and bottom, connections being made to the top sheets with the crest of the corrugations and the trough being connected to the undersheet, the upper surface being again covered with rubber flooring cemented on, and carrying wooden battens at intervals to ensure a firm foothold at the steepest inclination.

The telescopic motion brought its special problems. The chains which are disposed in each side of the gangway walls incorporate a Lockheed hydraulic compensating mechanism to ensure a balanced pull. To reduce the local stresses at the points of contact between the fixed and extending parts of the gangway, a pair of spring-loaded wheels is used running on a Delaron plastic strip, the springs being loaded to a predetermined figure. The point loads applied by these wheels would become excessive when the gangway is fully extended and loaded to the design specifica-

Ocean Terminal, Southampton Docks—continued

tion with passenger traffic, so at this point the springs allow the wheels to withdraw and pressure pads share the load. The plastic strip was chosen because of its low friction co-efficient to provide the smoothest possible telescoping motion.

CONSTRUCTION OF TURRETS.

The turrets transmit the hydraulic motion to the gangways and have necessarily to be made of extremely robust construction. The sides are made from plate box girders of ¼-in. material super-mounted by a box beam, which carries the journals for the two hydraulic rams which impart the slewing motion pushing and pulling simultaneously according to the direction of motion. The top beam also carries the shaft by which the turret is suspended and which, together with another shaft at the base of the turret frame, form the journals for rotary movement of the turret. The hinge pin on which the gangways are luffed is situated at the base of the turret, and a shaft at the upper part of the turret carries the cylinder end of the hydraulic luffing rams which are disposed either side of the gangway. A sheet metal fairing on the turret covers the luffing rams.

Both the upper and lower journal bearings for the turrets are of the self-aligning double-roller type, the upper one having in association with it a thrust-bearing carrying the weight of the turret and gangway. The bearings are mounted in housings attached to the girders of the shore structure. The shore structure is a space frame built up of standard extruded sections joined by gusset plates in an orthodox manner. Two road wheels on the turret side of the structure run on the lower platform rail, and the rear of the structure at its upper part carries rollers which move along the upper rail. Between the two turrets is mounted the control panel carrying the hydraulic control valves and push button stations. The hydraulic pump unit is mounted in the top rear part of the shore structure.

INTERLOCKING CONTROLS.

An ingenious system of interlocking controls has been devised to ensure the maximum safety of the equipment and the operators. Anchors are provided to lock the mechanism to the quay rail. Until the anchors are secured it is only possible to travel the whole structure along the quay side. No hydraulic motion is possible. Once the anchors are secured a reverse takes place in that travelling along the quay becomes impossible and power is available to manœuvre the gangways one at a time.

COUPLING WITH SHIP.

A sight hole in the control panel is provided to ensure correct positioning of the units before making connections with the ship. Indicators, visible at the control point, show the amount of slewing and luffing of the gangways, and the operator can by looking up the inside of the gangway, make the final adjustments necessary to guide the end to rest on the threshold of the ship's door.

A hook on the outer end makes contact with the ship's shell, and as soon as it comes to rest the telescoping motion is automatically declutched and the oil pressure is bypassed so that the gangway is instantaneously free to move with the ship. Safety alarms are provided in case the maximum extension is approached, and to give timely warning to allow for disengagement. The sequence of uncoupling operations is such that only the luffing motion can be used initially. In disengaging from the ship, as soon as the hook is raised from the ship's side the gangway must be fully retracted before other motions are possible. The control lever is then held in " slew in " position and the gangway slews parallel to the quay to its parking position. In taking the gangway out to the ship, the obligatory luff-up motion ensures that the end is free of the quay before slewing out can take place. Hand rails of hollow box section are fixed by cast brackets to the sides of the gangways.

OVERALL DIMENSIONS.

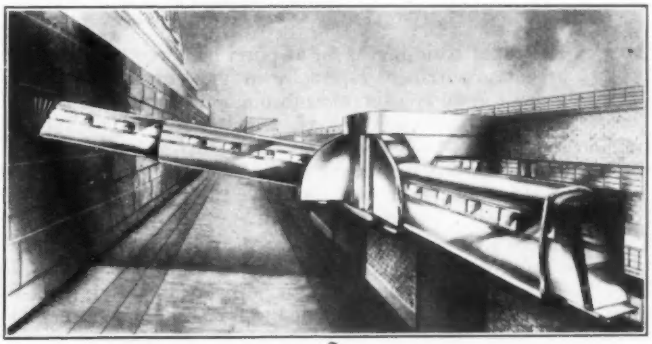
Shore Housing: 26-ft. long x 20-ft. wide x 16-ft. high, weight 9 tons.

Outer Gangway: 40-ft. long x 4-ft. 6-in. wide x 8-ft. high, weight 30 cwt.

Inner Gangway: 43-ft. long x 3-ft. 9-in. wide x 7-ft. 6-in. high, weight 30 cwt.

Each Turret weighs 1¼ tons, the Telescoping gear weighs 5 cwt, and the total length of the gangway fully extended is 68-ft.

The contractors for the gangways were Messrs. Structural and Mechanical Development Engineers Ltd. of Slough, Bucks.



Perspective drawing of Gangways when completed.

Details of the Sound Reproduction Equipment

The new terminal is equipped with an extremely flexible and comprehensive Public Address System which has been installed by Ardente Acoustic Laboratories, Guildford, Surrey.

One hundred and seventeen loudspeakers of different types and power ratings, each type for a specific purpose, are linked to a large amplifier bay with a total power output of over 400 watts. The equipment allows gramophone and radio programmes to be played simultaneously over the various loudspeaker circuits, together with facilities for microphone announcements, either over sections of the system or over the whole system at one time.

The whole equipment is operated remotely from a central control room containing the main amplifier rack and control desk. The operator at the control desk has a gramophone, microphone and a remote selector unit so that he may switch on gramophone and/or radio music and select the extension groups over which the music is to be played, without leaving his seat. From the same position he also controls the circuits over which microphone announcements are to be made. Mounted above the rack is a large illuminated map of the building and surrounding area on which the operator can see at a glance which loudspeaker groups are in operation and whether they are receiving gramophone, radio or microphone announcements. At the same time, additional microphones are provided in the two car-loading bays to enable operators to call up cars belonging to passengers or sight-seers.

The microphone at the main control desk takes full priority over the other microphones and can make emergency announcements over all loudspeaker groups at once if the necessity arises. These microphones enable operators to give details of train times, to call up passengers' cars and to make general announcements as to Customs and baggage requirements, etc.

AMERICAN TYPE APPROVAL FOR DECCA RADAR.

Official advice has been received that Decca Marine Radar Type 159 has now been type approved by the Federal Communications Commission, Washington. This approval gives authority for licensing Decca Radar for use in United States vessels, and is based on the results of tests conducted on board ship in accordance with the data specifications submitted. With F.C.C. Type Approval, Decca Radar has the great distinction of being the only marine radar equipment in the world which has both British and American type approval.

A new company with the title of Decca Radar, Limited, has been formed as a wholly-owned subsidiary of The Decca Record Company, Limited, to handle all activities concerned with Decca radar equipment previously dealt with by The Decca Navigator Company, Limited. The registered offices of the new company are at 1-3, Brixton Road, London, S.W.9.

Oil Handling at Ports

Some Developments in Continental Practice

(By a Continental Correspondent)

THE rapid handling of oil at ports has become a matter of urgent importance, especially in view of the phenomenal growth in oil consumption throughout the world. In 1938 this was 256 million tons, which had increased to 397 million tons by 1947. The causes of this increase are not hard to find, for oil is needed for almost every phase of our modern type of mechanised existence—in industry, in agriculture and in transport, on land, sea, and in the air.

Known oil reserves are unequally distributed throughout the globe, many countries being remote from sources of supply and therefore dependent upon sea transport for their oil, and this means that they are being compelled to increase their oil handling facilities considerably. At present we have the fantastic situation of the United States being an importer of oil from Venezuela in spite of her own gigantic domestic production. The demand for oil in ever increasing quantities has led to the development of very large vessels; before the last war some tankers, such as the French *Emile Miguet*, for example, had a deadweight carrying capacity of more than 21,000 tons; at present there are nearly twenty tankers under construction of from 28,000 to 30,000 tons deadweight, and new oil handling facilities are being planned on the basis of 40,000 ton ships. One leading company is building four in this country, and they are taking a further five, now being built in the United States, on Demise Charter. In addition, the British Tanker Company, Ltd. and the Anglo American Oil Company, Ltd. are building a considerable number of tankers of this capacity. Future tankers of 40,000 tons will have an overall length of about 683 feet, a beam of 98 feet and a loaded draft of 36 feet.

With this increase in size there has been a corresponding increase in speed, and an urgent demand for quicker turn-round than hitherto. Thus, whereas tankers of the 22,000 ton category have a speed of from 12½ to 13 knots, those vessels at present under construction will have speeds ranging from 14 to 16 knots; in certain cases it has been predicted that speeds will exceed even 17 knots. Certain oil pumping equipment for such ships has a capacity of from 1,000 to 1,500 tons an hour, in order to ensure that unloading will take 24 hours, and this corresponds to a total stay in port of from 30 to 36 hours, counting idle time and all subsidiary operations. Ports of discharge should therefore be equipped to handle from 2,000 to 2,500 tons per hour of oil.

Another important factor which enters into basic considerations of this problem is the ability of a refinery to produce substances which will enable it to compete successfully in international markets, and it is found in practice that there are refineries of relatively small capacities which can be run as profitable enterprises. There are other questions to consider, such as the size of the local market, shipping facilities for export, taxation and the geographical position of the refinery. The average annual oil consumption for a number of countries in 1947 was as follows:

	Imperial gallons per head
United Kingdom	81
France	32
Holland	57
Belgium	38
Spain	11
Italy	18
Switzerland	50
Sweden	123
Denmark	72
Norway	64

We are concerned here with oil handling facilities at ports, and it may be generally stated that, in the more highly developed countries of the world, oil ports will, wherever possible, have direct access for the largest vessels at a suitable state of the tide. There are many advantages in being close to a well-equipped port with modern repair facilities for large ships, and in many places the oil port is near the port of call for ocean liners, which applies particularly at Le Havre, Marseilles, Rotterdam, Southampton and London.

TYPES OF OIL PORTS

There are two main types of oil ports, namely: basins bounded on three sides by natural or made ground, or by continuous marine works; or isolated works. In new countries the latter may simply consist of a sea pipe line. The Royal Dutch Shell Group have four sea pipe lines in operation at Lutong; three are of 12 inch diameter and vary in length from 14,000 to 17,000 feet. The fourth is a 10 inch diameter line and consists of 9,000 feet of pipe, a further 6,000 feet being 12 inches in diameter. All four pipelines are of all-welded construction, protected externally against damage and corrosion; after being assembled on shore, they were towed into position by three craft.

On the other hand, discharging ports in industrial countries must satisfy all the requirements of large vessels during their very brief stay in port. The oil handling installation may attain a maximum handling rate of 10,000 tons per annum per lineal metre of quay and its structure is every day becoming more complex. Main port works should be built to receive tankers ranging from 8,000 to 45,000 tons deadweight carrying capacity. Use of the petroleum basin is compulsory only for the reception and re-export of the most dangerous substances as laid down by the International Convention at the Hague in February, 1939. Coasters transporting refined products are becoming increasingly large, and vessels of from 8,000 to 10,000 tons deadweight trade regularly from the port of Le Havre to a dozen ports in the vicinity. Thus a coastal port ought to be equipped for the reception of vessels from 500 to 10,000 tons deadweight, but of course the larger coastal ships will also be admitted to the main port.

In order to spread risks, it is desirable to allow only two large tankers at once to use a closed basin, of which there are not many examples in the world, although some basins are equipped for handling as many as six large tankers. It should be possible to evacuate all vessels from the basin rapidly and easily, in the case of a serious fire originating in any one of them, or in a nearby depot; this matter ought to be kept in view when planning the basin, and when arranging for the handling and towing of ships inside it.

It is an advantage to dredge the oil basin to a level slightly below that of the entrance, so that tankers can lie alongside the unloading jetty without grounding even when the tide may be exceptionally low. The width of the entrance to the basin should be as large as possible in order to facilitate the manœuvring of large ships, above all in case of emergency. Length of the jetty is determined by the requirements of tugs attending ships, it will vary according to the local weather conditions and will also be determined by the arrangement of the basin in relation to the prevailing winds. At Marseilles, for example, tankers are moored facing the strongest winds and tugs need not pull at right angles to the bow of vessel, it is sufficient to tow from astern.

Thus, the French engineers Callet, Couteaud and Deschenes have suggested that a basin 300 metres long is suitable for tankers having a maximum length of 210 metres, leaving a length of 45 metres in excess fore and aft, enough for a tug of between 30 and 35 metres length and her tow rope. At Le Havre, the strongest winds blow athwartships and the stern of the vessel is placed near the entrance of the basin.

Oil Handling at Ports—continued

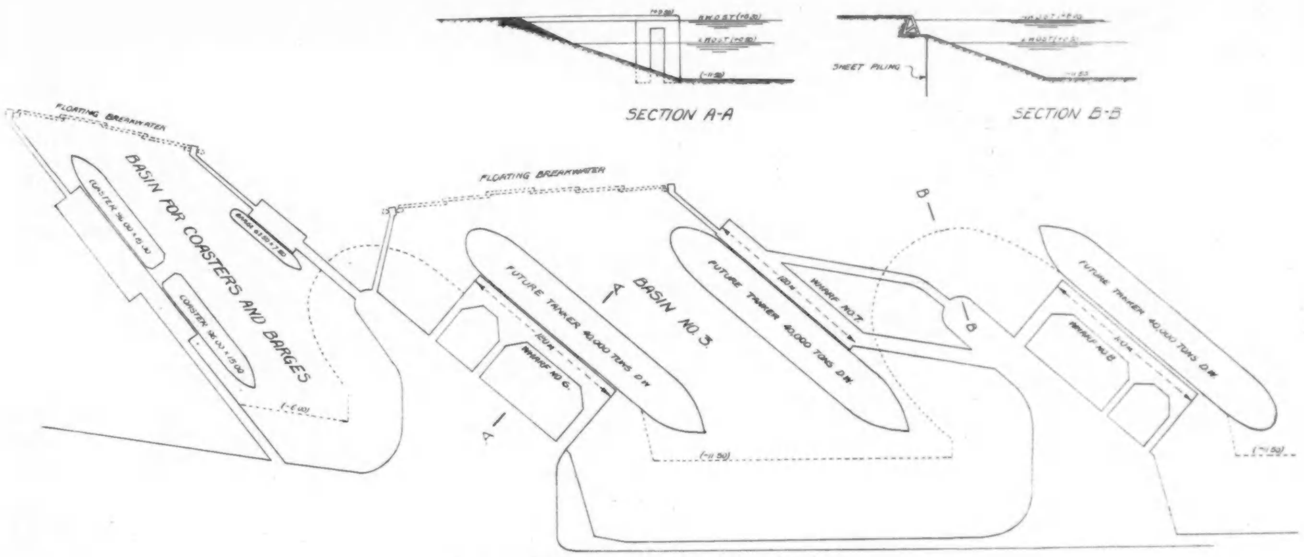


Fig. 1. Proposed new oil basin at Le Havre.

NEW OIL BASIN AT LE HAVRE

Considerable interest attaches to the proposed construction of a new oil basin at Le Havre (see Figs. 1 and 2); the main objectives of this project will be the creation of wharves Nos. 6 and 7, the provision of a new basin for coasters and barges, and the construction of an isolated jetty (No. 8) where large vessels can be de-gassed and repaired. The layout has been approved by the oil interests concerned, by the pilots, sailors and by the Industrial Maritime Company who operate a concession from the Autonomous Port of Le Havre, which will be responsible for the construction and development of these new installations.

Great importance has been given to the problem of mooring, in view of the accident which occurred to the tanker *Palmyre* of 22,500 tons, when she broke her moorings on the night of December 26th, 1946. Although the new wharves will be less well protected by the oil tanks ashore, they will, on the other hand, be

Fig. 2. Aerial view of existing oil basins and wharves at Le Havre showing site of proposed basin No. 3.

Oil Handling at Ports—continued

nearer to existing basins, and will be used by the largest ships. In order to provide the maximum possible safety, the wharves will be surrounded by embankments on three sides. All bollards on the embankments will be designed to withstand a direct pull of 100 tons. Wharf No. 6 will be equipped with the so-called " bad weather " equipment used at wharf No. 3, which consists mainly of heavy chains and of hawsers similar to those used by ocean-going tugs. This will permit accurate manœuvres to be undertaken in a strong south-westerly wind.

The large basins have been planned to allow a clearance of 65 metres between the forefoot of the largest tanker and the 4 metre depth below datum, under the most unfavourable circumstances. This is the clearance allowed in open water for towing manœuvres, based on a tug about 80 feet long being able to manœuvre without risk of stranding. Distance between the faces of the two wharves has been fixed at 120 metres. The distance of 60 metres between the sides of the largest vessels using the basin is enough to permit the handling of tugs and floating cranes, and to ensure the safety of a vessel in a high wind in the event of a fire breaking out in one of the ships. The centre line of Basin No. 3 has been arranged at an angle of 40 degrees with the shore in order to facilitate the entry and departure of ships.

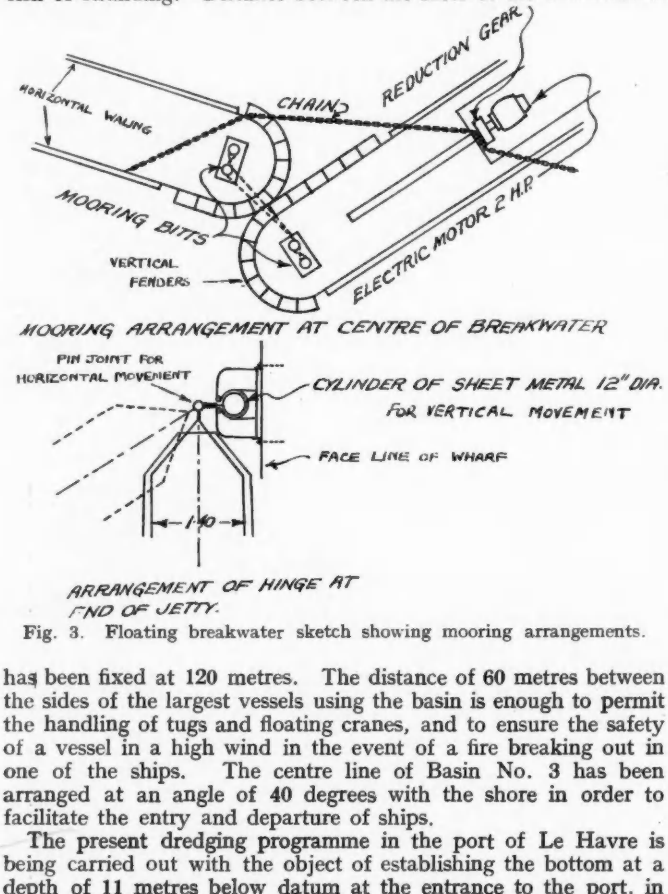


Fig. 3. Floating breakwater sketch showing mooring arrangements.

The present dredging programme in the port of Le Havre is being carried out with the object of establishing the bottom at a depth of 11 metres below datum at the entrance to the port, in the outer harbour and in the tidal basin. This depth will allow the largest ships to enter and leave the port at all states of the tide. The largest tankers at present under construction have a loaded draft of 10.50 metres and it is reasonably certain that the draft of future vessels will not exceed 11 metres.

An interesting feature of Basin No. 3 is the floating breakwater, some details of which are shown in Fig. 3; this comprises six units having a total length of 186 metres. Each unit is a pontoon, constructed of steel plates and angles, 1.4 metres wide and 0.7 metres deep, protected with vertical timber fenders at the ends and horizontal walings on the sides at water level. A walking way is provided along the centre line of each unit. This closing of the basin by a breakwater is necessary at Le Havre for safety reasons; in the event of a serious collision, oil on fire can spread over the entire surface of the tidal basin and thus cause considerable damage to other vessels, particularly Atlantic liners, and to port installations.

Wharf No. 6 is provided with a continuous frontage of 120 metres, and is equipped with bollards capable of withstanding a pull of 100 tons, the superstructure being founded on reinforced concrete caissons taken down to a depth of about 13.50 metres below datum. Wharf No. 7 also has a frontage of 120 metres and will be built on the same design. The minimum length of mooring is 30 metres; it would not have been possible to arrange for a greater length without reducing the width of the navigation channel between the central mole and the north jetty of Wharf No. 7. As shown in Fig. 3, each jetty is provided at its end with means for anchoring the floating breakwater so that it can slide up and down to allow for tidal movement. The new embankments are limited to the natural slope below the level of 3 metres above datum; there is stone pitching above this level, and in one place there will be concrete protection of the design shown in Section B-B.

Wharf No. 5 is at present under construction and this will be used for coasters of 4,000 tons like the *Clarus,* which operates between Le Havre and Rouen for the Shell-Berre organisation, but will not be able to accommodate two of these vessels at once. Before the last war, the wharf on the west side of the coastal basin was used for the de-gassing and repair of ships of all sizes. A petroleum port is compelled to have one wharf fitted up for the de-gassing of large vessels which cannot submit to the delays and restrictions imposed by a general de-gassing operation. When once such a vessel has been de-gassed, she can then undergo repairs which may be of long or short duration. Wharf No. 8—the isolated wharf—has therefore been planned to carry out these important functions.

Dredging will be carried out by the Port of Le Havre, employing the bucket dredger *Flandre II* with buckets of 800 litres capacity; allowing for a shut-down of 12 hours on Sundays, this dredger has an output capacity of 120,000 cubic metres of spoil a month. The quantity of dredging to be carried out is as follows: Dredging to 11.50 metres below datum in Basin No. 3, 900,000 cubic metres; dredging to 6 metres below datum in the coaster basin, 100,000 cubic metres; and dredging approach channels to a depth of 8.50 metres below datum, 800,000 cubic metres.

SITING OF OIL DEPOTS

Oil depots are generally built near oil basins, but they can be sited three or four miles from the latter without having much influence on the smooth working of loading and discharging operations, except in the case of viscous products which must be heated. It is nevertheless necessary to increase pumping pressure, and this is limited by the resistance of flexible hoses which are sensitive points in the transport of oil by pipe line, because they cannot withstand successfully a pressure greater than about 115 lbs. per sq. in. Again, in winter certain heavy oils must be heated to 70 degrees Centigrade in order that they shall flow easily, the need to increase temperature creating an extra charge on pumping cost.

If an oil depot serves several refineries it can act as a buffer depot for stocking petroleum products, and it may therefore be interesting to consider what reserve stock a refinery ought to hold in order to ensure continuous production. The answer to this important question depends upon the number of different qualities of petroleum that are treated, which, in a large refinery, may amount to six or seven. The size of stock will also depend on the number of distillation units which operate simultaneously in the refinery, and it would appear that the stock in the majority of cases should be enough to last for 15 days or three weeks.

TRANSPORT OF OIL INLAND

Port facilities for tankers are closely linked up with the means for transporting oil inland. In France, a complete study has been made of a proposed pipeline linking the port of Le Havre with refineries in Normandy and with storage depots in Paris; a study is also being made of a proposed pipeline from Marseilles to Basle in Switzerland. In order to deal with an annual traffic of about 1,500,000 tons between Le Havre and Paris, a diameter of 10 inches is found to be the most economical size. Total estimated cost of this pipeline was 115 million francs in 1938, and some 13,000 tons of steel would be required.

Oil Handling at Ports—*continued*

The following table gives details of the pumping stations en route:

Section	Length kms.	Dia. ins.	Location of Pumps	Power of pumping station h.p.
Le Havre—Gonfreville ...	11	10	South bank of port	200
Gonfreville—Port Jerome ...	24	10	Gonfreville refinery	525
Port Jerome—Petit Couronne	42	10	Port Jerome refinery	675
Petit Couronne — Gennevilliers	126	10	Petit Couronne refinery	900
Gennevilliers—Juvisy ...	38	10	Gennevilliers depot	300

These details are given in order to show the trend of modern thought in considering the transport of oil as a problem of complete collaboration between the various interests concerned. The problem obviously calls for a good deal of careful planning, especially in those cases where oil arrives at a large ocean terminal in the quantities handled by very large tankers. On the above proposed pipeline, it is not intended to build any storage depots either at the various loading points or at branches where there are valves enabling flow to be controlled in any desired direction. At each pumping station the man in charge announces the probable hour of arrival of an oil cargo and the estimated length of its passage through the pipeline; thereafter the arrangements are made at each pumping station to deal with the flow.

Each station is equipped with the necessary instruments for measuring and recording flow, and often different colours are introduced into a pipeline so that change over from one oil cargo to another can be rapidly and easily observed. Pumping stations should be built near storage depots at the commercial port and at each refinery, and they should be under the control of specially trained men directly responsible to the pipeline operating concern.

OTHER EXAMPLES OF FRENCH OIL PORTS

There are a number of interesting oil ports in France, and Fig. 4 shows an example which may be of interest and value to those studying the subject of layout and arrangement of such ports. In the Marseilles region the Etang de Berre, situated some 50 kms. north-west of the town and port of Marseilles, had attracted many refinery concerns who built installations around its shores from 1921 onwards. The growth in size of tankers since that date has imposed heavy liabilities on the authorities which could not have been met except at the cost of very expensive works. The idea of providing for large tankers to use the Etang de Berre has therefore been abandoned, and it has been decided to proceed with a new oil port at Port de Bouc-Berre which is likely to become a very important refinery centre for treating petroleum from the Middle East and re-exporting refined products to a large part of Western Europe, North Africa, and even to the United States. It is estimated that, by 1953, some eight million tons of crude petroleum will be imported every year, and that this rate of importation is likely to increase with the passage of time.

The new oil port is situated on the south bank of the channel leading to the Etang de Berre, and will handle tankers of all sizes, discharging crude petroleum to three refineries in the district, whence refined products will be re-exported either by sea or by river. The refinery of La Mede, 10 kms. from the port, Berre at 35 kms. and Lavera at 1 km. will all be supplied by pipelines linking them to the oil depots established at the south of the port. There is considerable rock breaking and dredging work proceeding at the Port-de-Bouc channel, as well as deepening, in order to allow passage of vessels drawing 34 feet. Dredging at Port-de-Bouc and at Lavera will be carried out to 10.80 metres below datum.

There will be four basins in the oil port, each 300 metres by 100 metres and one basin 300 metres by 80 metres open for their whole length to the water of Port-de-Bouc. Each basin lies along the direction of the prevailing wind, the mistral; the smaller basin being used for coasters while the others will accommodate large tankers. The bottom of the former will be dredged to a level of 8 metres below datum.

Each refinery company will build its own oil depot near the port, and these depots are constructed on ground which slopes steeply in the direction of the basins, some oil tanks having their bases more than 100 feet above water level. When the first stage of this work has been completed, the storage capacity will be 150,000 cubic metres which will be further increased to 250,000 cubic metres as production rises. The oil tanks will be of the floating roof type having capacities ranging from 15,000 to 20,000 cubic metres. The pipelines taking crude oil from the storage depots to the refineries at La Mede and Berre respectively will have a diameter of 14 inches and will each have a capacity of 350 tons per hour of oil.

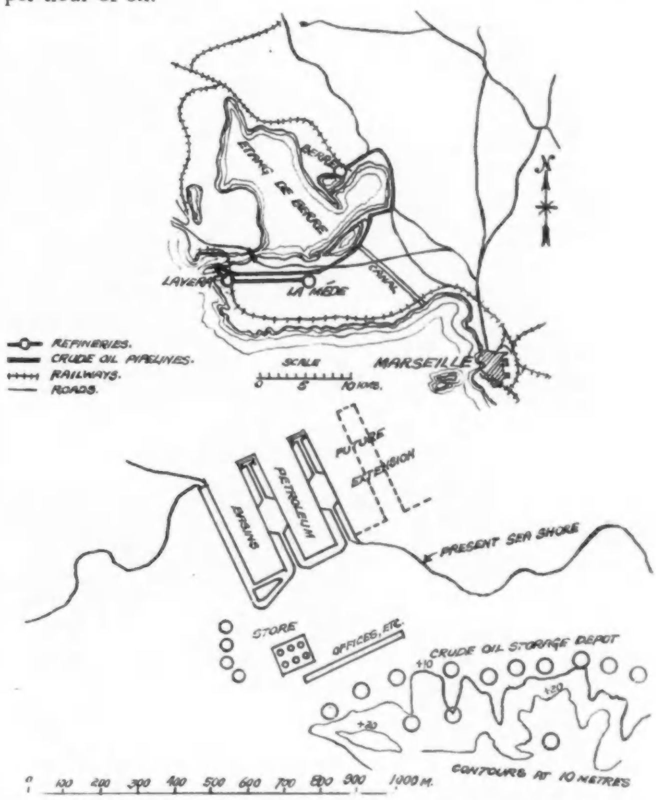


Fig. 4. Site of new oil ports near Marseilles and layout of Lavera

The oil port at Dunkirk, our last example, serves a refinery now under construction which is close to the port. The nearest oil cargo unloading wharves are about 1 km. from the refinery, and the new petroleum basin will have accommodation for handling three large tankers, as well as barges and coasters. The main objective of the works now in progress, is to ensure the simultaneous discharge of two large vessels and the loading of two smaller vessels. Large vessels will be accommodated at the wharves formed by a jetty 85 metres long and 30 metres wide, its deck being 8.15 metres above datum; the bottom of the entrance basin will be dredged to 7 metres below datum. The jetty is constructed of a thick reinforced concrete slab supported by vertical and inclined piles of reinforced concrete. Every second pile is double to form an expansion joint about every 42 metres.

(To be continued)

IMPROVEMENTS AT THE PORT OF GLASGOW.

At their meeting held early last month, the Clyde Navigation Trust approved a scheme estimated to cost £160,000 for the widening of the roadways on the south and west quays of King George V Dock and the provision of an additional paved area for open storage of heavy goods on the west quay. The new lay-out is necessary to avoid congestion of traffic, and will fit in with the plans for the construction of No. 2 basin and with the overall scheme for the new £8,000,000 dock. It also will take into account the requirements of the shipping companies and others concerned.

Spanish Formulæ for Rubble Mound Breakwaters and Sea Walls

The Spanish engineers, Professor Ramon Iribarren and Dr. Nogales y Olano, have been responsible for several interesting studies of wave effects on breakwaters and beaches. Latterly they have collaborated in a paper on the "Limiting slope between the break and the reflection of waves," and they have also reprinted a paper, first published in 1938, on the "Weight of blocks and the profile of rubble mound breakwaters and walls".

These two papers are studious analyses of a limited range of sea conditions and, used with due care, should be helpful as guides to a designer of sea walls or breakwaters of tipped blocks or quarry rubble, and also assist in fixing the optimum angle of slope of ramps under piled wharves in harbours subjected to jobble or surge disturbance. Whilst the argument is based on conditions of little or no tidal range, it may be applied by suitable interpolation to places where there is considerable fluctuation between high and low water.

The following formula is suggested by them for rubble and artificial block mounds:

$$P = \frac{N A^3 d}{(\cos\alpha - \sin\alpha)^3 \ (d - 1)^3} \qquad (1)$$

where,

P = weight of blocks or boulders in kilograms.
N = 15 for mounds of natural quarried stone.
= 19 for mounds of artificial or cast blocks.
A = height of the wave at breakwater in metres.
d = specific weight of material of blocks or boulders in tons per cubic metre.
α = angle with the horizontal of the slope of the breakwater face.

For the various sizes of the submerged blocks, the value of A in expression (1) can be taken as the reduced orbital diameter of the surface height at the depth of water, in metres, considered. If there is a change of slope, then the trigonometrical values must be adjusted also.

An American version of the above formula has been devised by Epstein and Tyrrell and is:

$$P = R \frac{5 A^3}{(d - 1)^3 \ (\mu - \tan\alpha)^3} \qquad (2)$$

where R = constant.
$\mu = \tan\phi$ = tangent of natural slope of the material.

Now if: $\dfrac{1}{1 - \tan\alpha} = \dfrac{\cos\alpha}{\cos\alpha - \sin\alpha}$

and $\mu = 1$, that is $\phi = 45$ degrees, then it becomes obvious that the only difference between the expressions (1) and (2) is that in the latter, N is replaced by R $\cos^3\alpha$, which is a refinement of doubtful value. The expression (1) has been applied in practice in Spain for over twelve years and is popular with the engineers of that country. Near Barcelona the port engineer, Isla, constructed a sea wall extension based on expression (1).

A subsequent gale destroyed the older part, but the new addition was undamaged.

The second paper is one of very debatable value and savours of academic interest only. The argument is that there exists a limiting slope which promotes equally the phenomena of the breaking wave and the reflected wave and which, at the same time, separates them, such that for an increase of steepness the wave is reflected and for a decrease of steepness it breaks. Thus, between the limits of total reflection and total break, there is a series of slopes in which there are partial breaks and partial reflections—of varying relative magnitudes, one or the other predominating. This limiting slope (mean) the authors suggest can be approximated to by the following expression:

$$i = 4/T \ \sqrt{h/2g} \qquad (3)$$

where i = inverse of slope = horizontal distance/vertical depth.
T = period of wave.
h = height of the wave in metres.
g = acceleration of gravity = 9.81 m/sec².

The Dutch Hydraulic Laboratory has already established that:

$\dfrac{\text{horizontal length of slope}}{\text{wave length}}$ is equal to or less than $\frac{1}{4}$

produces total reflection, and:

$\dfrac{\text{horizontal length of slope}}{\text{wave length}}$ is equal to or greater than $\frac{1}{2}$

produces total break.

The horizontal length of slope is measured on the still water line to the point where the toe of the slope meets the flat bottom or in the case of ramps which are discontinuous to the point of break.

Engineers conversant with Spanish will find the two papers of useful practical interest within the limits mentioned above. They are published by Revista de Obras Publicas, Madrid.

R. R. M.

Correspondence

To the Editor of *The Dock and Harbour Authority.*

Dear Sir,

CONCRETE IN DOCK AND HARBOUR CONSTRUCTION

I have read with interest the recent article on Concrete in Dock and Harbour Construction by Mr. Rolt Hammond, A.M.I.C.E., of which the subtitle is "A Review of Recent Developments."

Under the heading Prestressed Concrete Piles, I was surprised to find no mention of work carried out in this country. The sole examples given are confined to Belgium and Trinidad.

Apart from many prestressed concrete piles driven on industrial sites, during 1949—12-in. x 12-in. x 50-ft. piles were driven on the Clyde for a ship building berth of Messrs. Fairfield Shipbuilding and Engineering Co. Ltd., and 10-in. x 10-in. piles were driven for a jetty at Southampton. Early in 1950—12-in. x 12-in. piles were driven for another shipbuilding berth of Messrs. Smiths Dock Co. at Southbank—on Tees, and piles have been supplied and are being driven for two more berths. The engineers for the work on the Clyde and Tees were Messrs. T. F. Burns and Partners, Westminster, London, S.W.1.

Quite recently 12-in. x 12-in. x max. length of 60-ft. piles were supplied to Dover Harbour Board. Two of these piles were driven through filling into rock chalk penetrating to a distance of 4-ft. 6-in. to 5-ft.

Certain preliminary work has been carried out on prestressed fender piles and development work on these and on hollow piles is proceeding.

The first prestressed concrete piles made in this country were driven during May 1949 and all the piles mentioned above were cast by the Concrete Development Co. at Iver, Bucks and sent by road or rail to the site.

I feel that your readers should know that the development of prestressed concrete piling is going ahead rapidly in this country and that British engineers have made a very substantial contribution to our knowledge on prestressed concrete in general and to piling in particular.

Yours faithfully,

I. D. SCOTT, A.M.I.C.E.

100, Eaton Terrace,
London, S.W.1.

Coast Erosion

An Enquiry into Causes and Remedies

By R. R. MINIKIN.

(continued from page 94)

SAND BEACHES

On the wide flat sand beaches from Etaples to the Somme, the author checked observations he had already made on the beaches of the east coast of England. The fine sand of this French coast contains little mud and dries out quickly. The waters are so clear that the bottom can be readily observed. In a length of ten miles there is a uniformity of beach profile broken only by pools formed at the van of travelling sand banks. These banks travel northward in the direction of the prevailing wind and flood tide. The front slope of the lower foreshore is not regular for this reason. The sketches of Figs 82 (a) and 82 (b), which are not to scale, show at (a) the form of the contours of the beach at low tide about the area of a beach pool which drains to the sea by the stream "A". This makes a channel through the sand in front of the forward end of the high contour at "B" and "C". The "X's" at these points mark the positions of stakes driven well

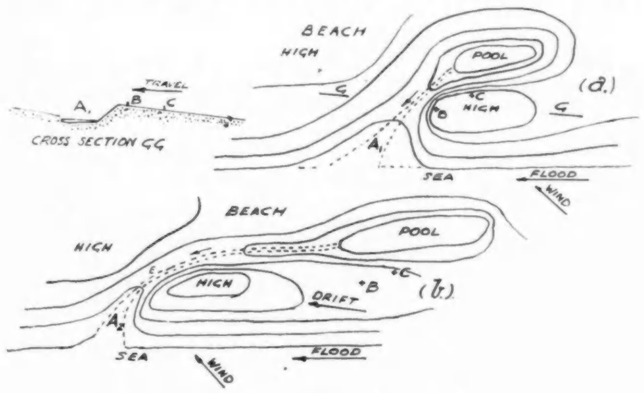


Fig. 82. Le Touquet. Beach phenomenon.

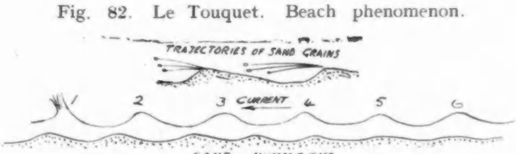


Fig. 84. Standing waves in beach stream.

into the beach at the commencement of observations. The pool was about 100 yards long and 50 yards wide. As the tide receded, the pool was left and the last flush of the surge wavelets initiated the channel formation in the valley. There was a train of these banks along the extensive front; the northerly front being 18 to 24 inches higher than the fronting valley.

These travelling banks are formed by wave action and tidal current when the beach is submerged, and the swash of the waves, on the retreat of the tide, evens out the slope on the seaward side, whereas inshore, to the front and normal to the flood current, they are steepest; in other words, they are steepest at the travelling front, as the cross-section "G.G." shows. When the pool first begins to drain, the current is sluggish and pulses with the entering wave action, but as the tide recedes the current increases and when flowing at about 18 inches per sec. it carves out the bed and sides. The concave sides are the weakest, the water biting into them at the water line and causing the collapse of all sand above it, the resulting profile becoming as shown at "G.G." The spoil from these channels is carried swiftly seawards and as the tide drops the velocity of the stream increases, so that quite a large

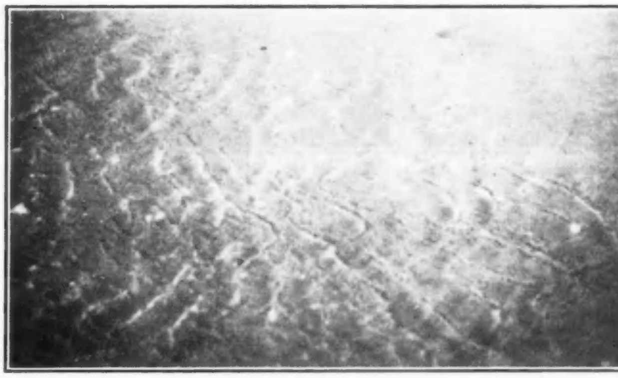


Fig. 83. Pattern of sand hummocks caused by flowing current taken through water.

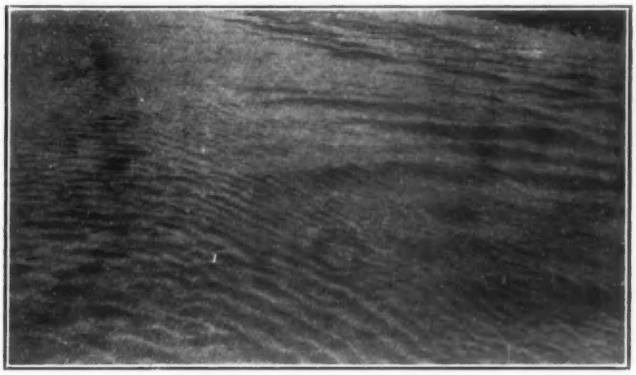


Fig. 85. Formation of standing wave in beach stream.

Fig. 86. Paris Plage—ridge pattern due to current flowing over beach.

quantity of sand is transported back to the sea. The stream "A", on reaching the flatter beach near the water line, fans out into an estuary and there deposits its burden, which may or may not become again mobile.

Over a period of 16 days the progress of the steep front of the sand bank was measured, using "B" and "C" (Fig. 82 (b))

Coast Erosion—continued

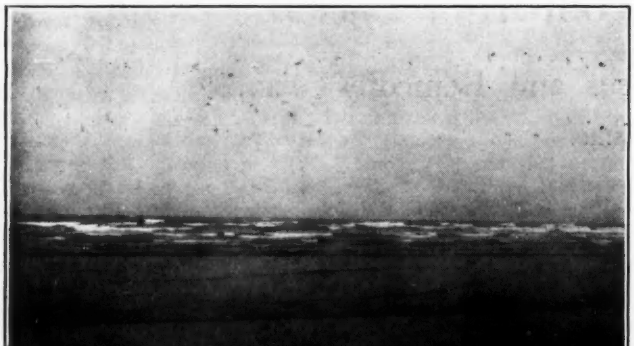


Fig. 87. Pas de Calais coast. Flat sand beach.

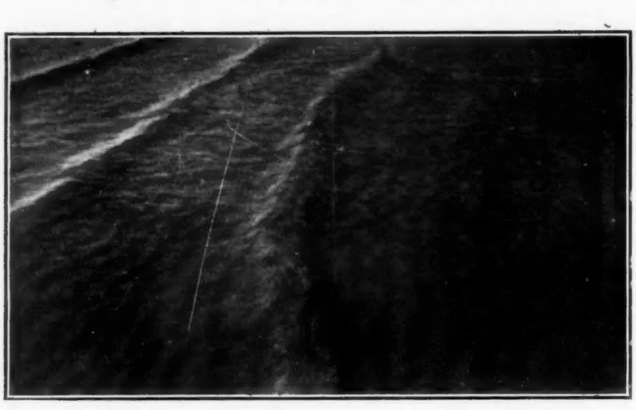


Fig. 88. Small wave group resulting from a broken wave of higher amplitude.

as datum. In this time the front travelled 145 feet to the north and 30 feet to the east. Some days after a stiff south-west wind the travel was up to 12 feet; in calm weather, only 6 feet in 24 hours were measured. There was little variation of relative heights, though occasionally on a change of wind direction there was a slight flattening of the forward slope, but the steep inshore slope, parallel to the water line, remained unchanged. With the travel of the bank, the pool increased in size and a strong current developed in the drainage channel. The stream averaged 12 feet wide and 4 inches deep. At a point "E", whilst still subjected to the flush of wavelets 2 inches high and a stream velocity of 10 inches per sec., the opportunity was taken to test the effect of miniature groynes 20 inches long of various projecting heights. Unfortunately the wave action did not last in any one place for longer than 5 minutes, due to the falling tide; nevertheless it was interesting to note that the groynes, irrespective of height, tended to cause scour of the bed about the extremities, and it brought into prominence the fact that the directly visible amount of scour was not the total amount, the effect was more widespread. As the scoured material was being whisked away, other grains were drawn off the surrounding bed to take their places, even to cause a slight slip of the bank at the water line a groyne length away upstream. This is a point of importance to be borne in mind when dealing with full scale systems. The only visible accretion was downstream, beyond the last of the three small groynes; there was none in the groyne bays.

The wave effect was negligible, or was so small that it could not be observed. Both sides of the stream were tested in this manner on several occasions. Note, that of necessity the wave travel was opposed to the current direction. There was little doubt that any obstruction to a current sufficiently strong to transport the sand grains in intermittent suspension only aided the destructive power of the current. Where the obstruction was of a nature to cause an eddy in the lee, deposits of the coarser grains took place. These deposits were humps and not linked up with the water verge. For some reason which the author could not trace, natural eddies of great intensity suddenly took place and formed within little more than a minute vortices of water within the bank, scooping out holes 2 to 3 feet diameter and about 6 inches deep below the bed level. It was suspected that a sudden collapse of the almost vertical wall of damp sand formed a temporary obstruction about which the swift current (20 inches per sec.) wheeled and initiated the whirl pool, whose existence was of a few minutes' duration only.

In a straight, swiftly running section of the stream, before reaching the flat of the estuary in water ranging from 2 to 5 inches deep, there were hummocks of sand visible on the bed (Fig. 83). Here in the deeper channel the smooth surface of the water would suddenly become ruffled and then would form tiny wavelets which grew larger and regular in form, emitting a purring note. These attained a height, trough to crest, of 4 inches and about 24 inches long. There was no forward movement. Then suddenly, with the not unpleasant noise of water tumbling over a rapid, the first wavelet downstream would curl over and break. Within a second or two the next one, number 2 (Figs 84 and 85), would do likewise, to be followed at similar intervals by each one of the whole train up to 14. Then the water would become smooth again for a time before the phenomenon occurred again.

The cross section shows the mechanism as observed. The mobile larger grains of sand from the hummocks were shot forward from the crests until the height of that at (1) decreased the depth of water and made it impossible for No. 1 standing wave to survive. In breaking, it released the energy of its followers. On sunny days the trajectories of the sand grains in these waters were plainly visible as points of light.

This beach stream, in its 4 to 6 hours activity, displaced at least 250 cubic yards of sand to a lower level, but the point to note is that it was deposited an average distance of 100 yards in the

Fig. 89. The meeting of the return backwash and oncoming surge.

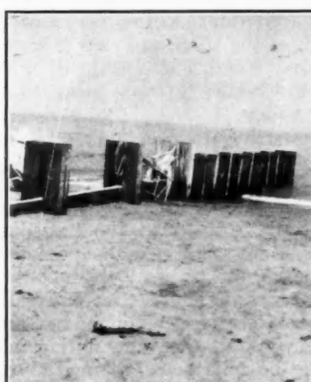


Fig. 90. Swanage. Efficient groyne on sand beach.

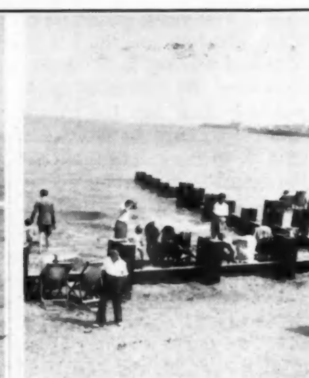


Fig 91. Swanage. Sand beach and groynes showing spur.

Coast Erosion—continued

direction of the littoral drift. In the estuaries of these streams, one notes that there are many islands of sand of higher contours than the adjacent beach, showing that it is the deposited material from the stream. Thus it will be appreciated that erosion and accretion on the same beach may still go on by water action after the fall of the tide.

The sand hummocks formed by a flowing stream are shown in Fig. 86—which is taken from the direction of travel of the water as can be noted from the steeper slope of the fronts of the ridges.

It should be appreciated that there is much to learn from observations of the behaviour of the smaller forces of a sand foreshore as the larger beaches are, after all, only large accumulations of similar small particles, and that which happens on the larger scale is only a summation of the behaviours on the smaller scale. The great forces emanating from open sea wave action and the full force of the tidal streams in deep water show similar patterns of sand ripples, hummocks and travelling banks, as, for example, those of the Goodwin Sands at low water—and from the forms of these features the tendencies of the operating forces can be told.

The foreshore of a Pas-de-Calais beach is shown in Fig. 87, where the flatness allows of a wide, gentle surge to spread over the sand about low water. It was noted that after the break of the white topped waves the surge reformed into smaller single waves, as shown in the foreground. In those parts of the beach where slight local depressions allowed tongues of surge to expand shorewards, the reformed single wave broke and gave place, invariably, to a group of three wavelets (Fig. 88) about 3 feet apart and 2 to 3 inches amplitude. These wavelets travelled on and faded out rather than broke. It is suggested that it was these wavelets which caused the formation of the sand ripples visible through the water, which was about 4 inches deep. It will be found that where these sand ripples are left on a dry beach the latter has either a slight negative slope, that is inclined down shorewards or is almost level and is free from the return wash of the expended surge. Where the surge can return to the sea over the same part of the beach the ripples formed in the forward wavelet advance are erased by the backwash (Fig. 89), which is usually charged with mobile sand particles.

Fig. 92. Bournemouth. Concrete jetty on sand beach.

Fig. 93. Bournemouth. Showing deep lee and well filled weather side on sand beach. Note wind drift.

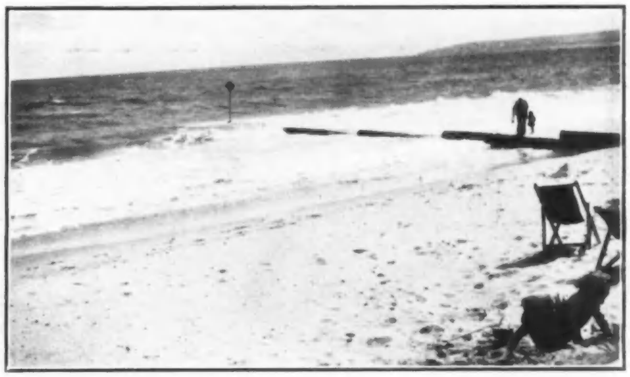


Fig. 94. Bournemouth. Stepped type of concrete groyne.

Fig. 95. Formation of wind hummocks on sand beach and concrete groyne.

On the East Coast of Lincoln, Norfolk and Suffolk beach pools are so frequent that holiday makers in the seaside resorts look upon them as amenities. They would be if the dry beaches at high water were as extensive as they are on the N.W. Coast of France. However, they are not so well favoured. Over the last 50 years there has been some change in the North Sea conditions such that beaches which had formerly enjoyed surpluses of dry sand, which under the influence of the wind formed sand dunes up to 30-ft. in height now suffer from a scarcity of sand inshore. Such a place is Mablethorpe where many of the original sand dunes fringing the beach have been washed away by sea action leaving only thin blankets of sand overlying the clay bed sub stratum.

In recent years sea walls of the stepped and curved wall type as at Dymchurch, have been constructed on a frontage of about four miles, the foreshore being further reinforced with timber groynes, projected to rehabilitate the depleted sand beach, but here the problem is difficult. The tidal currents offshore in the ebb and flood for some period of time reach 2½ knots and even with a favourable accretive sea action retard the landward impulse of the travelling sand banks which reach the lower foreshore. In those patches of the beach where there is only a foot or two of sand lying on the clay bed pools are formed on the ebb tide, and on the flood tide the restricted porosity of the beach renders the surge more violent and tends to a draw-down of the sand. Long low groynes may assist the stability but it should be thoroughly appreciated that groynes for sand trapping and retention are neither sufficient or reliable without the supporting conditions of a plentiful supply of material in the form of invading sand banks, and the absence of lateral currents over ½ knot.

Coast Erosion—continued

Fig. 96. Cliftonville. Concrete groyne on a bare beach depleted of sand.

Fig. 97. Parame, France. Stone jetty on sand beach.

Another characteristic of sand is the grain size and shape; fine sands and worn rounded grains are very mobile and do not form a compact firm beach unless there is an appreciable amount of silt settling out with them in the pools. The sands at Dymchurch pack firmly and in sheltered spots on the Belgian Coast where favourable eddies are provoked the fine sands with proportions of silt leave a compact firm beach at low tide.

Those sand beaches of crescentic bays lying just within a line drawn to represent the direction of the prevailing wind and tangential to the headland in the wind appear to be most favourably retained by low groynes. For example, Swanage, Bournemouth, Weymouth. There is a very ingenious device to hold the sand of the upper beach to the lee of the Swanage groynes (Figs. 90 and 91), which are built substantially of about 12-in. x 12-in. piles and 3-in. stretchers. It will be noted that just short of high water a spur groyne is erected normal to the main groyne. It is about 50-ft. long and of identical construction. The Bournemouth beach groynes are of concrete construction (Figs. 92 and 93). It will be seen that there is a wide difference of beach level on the weather and lee sides which would at first sight appear to provide evidence that the operation of a groyne in sand is similar to that of shingle. This we know is not the case, besides, wind plays a considerable part in the travel of sand along a shore, in fact when the photographs were taken men were employed on the promenade shovelling back to the beach considerable quantities of blown sand accumulations. Note the wind-swept appearance of the sand surface in the foreground. A more efficient type of concrete groyne on this beach is shown in Fig. 94. It is only 2-ft. wide and is stepped to correspond with the normal profile of the beach. Here there is a less pronounced saw-toothed water line.

A similar type of concrete groyne is shown in Fig. 95 where the sand to the weather side almost coincides with the crest of the groyne, but there is a difference of about 12-in. in the lee. Now obviously there is a drift or these differences would not occur. The Causal forces are about equally divided between the slow but sure differential impulse of wave action, tidal current, and on the dried beach the more speedy and positive transport of the grains by the wind; note the small sand-blown ripples in the foreground of Fig. 95. At times in strong winds of force 6 and above, clouds of sand grains are frequently blown along from flat lower beaches after the surface grains are dried.

Again, Professor Iribarren (San Sebastian) has pointed out that large banks of sand can be swept over the sea bed of the lower beach by an induced current caused by the difference of hydrostatic head between two points of the same beach. The hydraulic gradient is brought into action by wave expansion laterally in a sheltered lee, or by wave height reduction in shallowing water, whilst the other point of the beach is subjected to the stress of the higher waves.

The spaced apart piled groynes on the beaches of Lowestoft, together with a high water palisade running parallel with the shore line appear to be extraordinarily efficient, maintaining a fine beach on a none too favourable coast line. Further to the north, at Mundesley-on-Sea a fine strand is reinforced with zig-zag groynes, each stretch of 15-ft. being set at 45 degrees to the coast line and the normal to the coast line. The modus operandi of these types of groyne is not very clear, but the author suspects that it is due to local complex small eddies set up in the vicinity of each unit causing a settling out. It is also characteristic of sand and small particle heaps to grow once the process is started; the success of the Case groynes at Dymchurch no doubt depended upon observation of this feature.

For some years the sand beach at Cliftonville has been depleted leaving bare the flat rock surface (Fig. 96). It is supplied with low concrete groynes which are now in bad repair and further have the disadvantage of being pierced at about half tide level by a gap 30-ft. wide to allow passage of vehicular traffic along the beach. Above these gaps the sand accumulates, but seawards the beach is bare as the photograph shows. It would perhaps be of advantage to convert the existing groynes into a hump-backed type

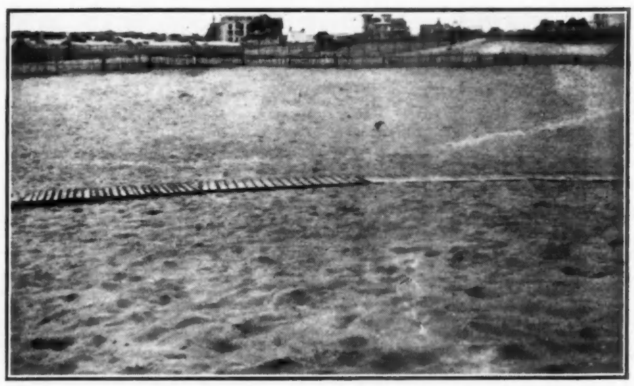


Fig. 98. Paris Plage. Fencing sand-traps on dry beaches

Fig. 99. Paris Plage. The protection against wind erosion of dry sand.

Coast Erosion—continued

Fig. 100. Paris Plage. Planting and fencing of dry sand.

Fig. 101. Paris Plage. Protection of sand dunes.

with low spurs at half tide line. The stone jetty (Fig. 97) was constructed in the entre of a straight sea wall about 2,000 yds. long and has never been successful in building up the find sand of the beach by water action. The photograph is taken from the lee but there is little difference in the submerged beach profile on the weather side although in the corner at the root, the heap of wind-blown sand is only two or three feet below the promenade level. High groynes on a sand beach is time and money wasted.

On the fine sand beaches of Paris Plage (France) the dry sand above the high water line is protected from dispersal by the wind by split chestnut fences (Fig. 98), placed normal to the prevailing wind direction. The efficiency of these cheap structures is remarkable. In the photograph, the trench board in the foreground is 9-ft. below the crest of the sand at the fence. A similar sort of action takes place here as on the spaced apart piled groynes the sand grains carried by the wind strike either the verticals or the eddy currents set up about them and settle out building up the height of the crest. The fence shown is half buried, and to the right of Fig. 99 the same fence is shown after being dug out and re-erected to the windward about 10-ft. The next fence to the windward is also shown withdrawn and lying on the sand prior to re-erection at the brow of the collected sand crest. When the sand accumulates to about promenade level it is planted with marram grass, Townsendi, and with chestnut brushwood faggots, as shown in Figs. 100 and 101. It is found that this method acts successfully, but a good deal of damage is caused by tourists.

Dredging at New Zealand Harbours

Joint Ownership Plan for East Coast Ports

It was reported in a recent issue of the Otago "Daily Times," New Zealand, that comprehensive plans for the joint ownership and operation of dredges by harbour boards on the east coast of the South Island have been discussed by representatives of these boards at a conference in Christchurch, and final details of finance and construction are to be worked out in preparation for the formation of an East Coast South Island Dredging Board.

A Report was presented by a committee of investigation consisting of the engineers of the Lyttelton, Timaru, Otago and Bluff Harbour Boards. This report stated that the authorities of the ports of Nelson, Lyttelton, Timaru, Otago and Bluff each owned and operated its own dredge, and during the last six years, the average combined output per annum of these five dredges amounted to 2,189,781 tons of material dredged, very largely on a single shift. Based on actual dredging returns the combined average output of the Lyttelton and Otago dredges working on single shift was 1,717,600 tons per annum. On two shifts it was estimated that the annual output of these two dredges would be at least 3,345,000 tons, which was 1,245,000 tons per annum in excess of the actual average dredging requirements of the six South Island ports per annum. From these facts it was obvious that the maintenance of five dredges to perform the work of two was not economic.

To enable the six ports to overcome the disadvantages of the present system, it was suggested that a reasonable solution lay in the form of joint ownership and operation of dredging plant, sufficient, when working to capacity, for the requirements of the combined boards.

"The committee feels that the attention of all concerned with shipping might be drawn to the fact that much of the dues paid on shipping is absorbed in dredging operations to maintain ports at their present depths," states the report. "It is thus seen that over the past years some 2,000,000 tons of material have been dredged each year from the various ports without producing in general any appreciable increase in depth. Any demand for increased depths will necessitate the levying of increased dues, not only for the cost of the dredging to give the greater depths, but for the steeply increased perpetual expenditure necessary to maintain the deeper channels. The dredges now in service are in most cases very old and free from financial charges. The cost of new dredges has increased very sharply and their building will require the raising of loans which will need to be serviced."

The report stated that it was felt, however, that the time for the formation of a dredging board to cover all the South Island ports named was not yet ripe. It became apparent that the Bluff, Timaru, Lyttelton and Otago boards would not agree to participation in the proposed board until it became necessary for them to purchase new plant, as with the exception of Otago, the boards had no capital charges to pay on existing plant and there would be little if any financial advantage in making a change.

"Maintenance dredging in Otago is somewhat complex owing to the diversity of the work," the report continues. "The entrance channel and possibly portions of the lower harbour could be efficiently dealt with by a trailer suction dredger, but this would require to be provided by trial. Upper harbour dredging is costly on account of the long haul involved and requires a bucket dredger. Possibly the swinging basins at Dunedin could be maintained by a suction dredger."

The report states that the plant which would most nearly meet the requirements was as follows:—A 2,000-ton (40,000 cubic feet) hopper capacity bucket dredger (£384,000); a 1,000-ton (20,000 cubic feet) hopper capacity bucket dredger (£279,000); and a 40,000 cubic feet hopper capacity suction dredger (£335,000), the total cost being £998,000.

The 2,000-ton hopper capacity dredger would have the same hopper capacity as the dredge *Otakou*. A major factor in deciding upon the replacement of the *Otakou* with a vessel of similar dimensions was the special dredging conditions in Otago, where a considerable proportion of the work required a long haul to sea. Consequently, large hopper capacity was of first importance.

It was obvious, the report concluded that a large number of combinations of plant for various ports, each giving a different cost, could be worked out. After some analysis the calculations were based on the following :— Otago and Oamaru 2,000-tons hopper dredger; Bluff, Timaru and Nelson, 1,000-ton hopper dredger; Lyttelton, suction dredger.

New Methods of Loading and Discharging Cargo

Description of Three American Inventions

Some revolutionary developments in increasing the speed of loading and discharging vessels have recently been the subject of experiments in American shipping circles. Three inventions by Capt. V. C. Farrell of the Amerian Merchant Marine, a Co-ordinated Rolling Wing Deck, an Improved Burtoning Cargo Gear, and a Positive Load Control Crane were demonstrated at the Port of New York in September last, and very successful results were claimed. Details of the new equipment are as follows:

FARRELL CO-ORDINATED ROLLING WING DECKS

Preliminary tests made by the United States Army, of the Rolling Wing Decks installed on the "Pvt Francis X McGraw," have shown that in loading and discharging general cargo a saving of at least 50 per cent. in time and cost can be anticipated, with this device and the Farrell Improved Cargo Gear in combination. Three subsequent loadings for transatlantic voyages have definitely established a saving in time and cost exceeding 50 per cent. Extremely heavy weather in which the vessel rolled 30 degrees with the Rolling Decks loaded has been encountered without damaging them or the cargo. The following are records of loading the entire 'tween deck equipped with the Rolling Decks:

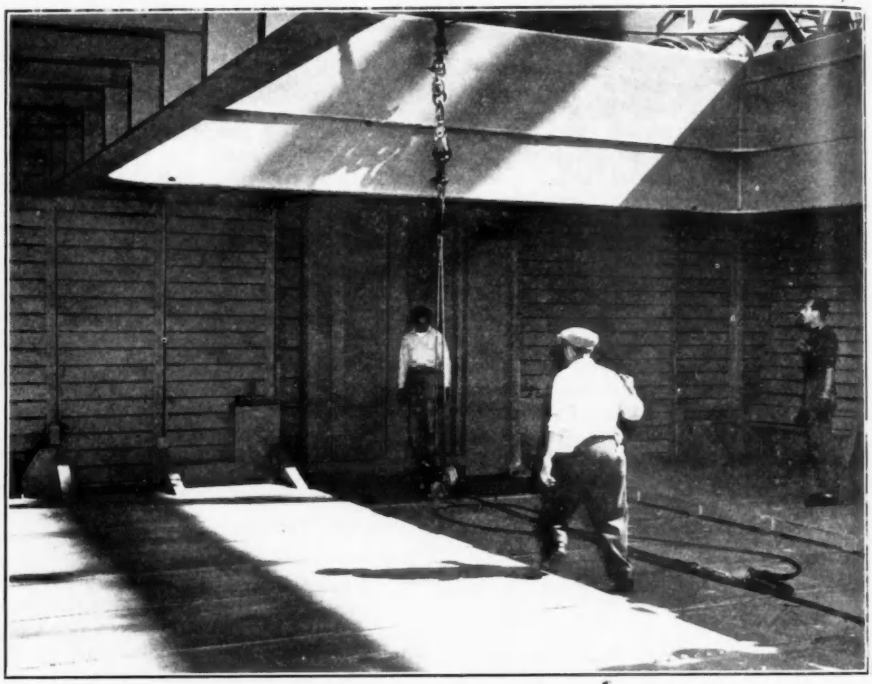
First voyage—135 weight tons or 535 measurement tons loaded in 5 hours 10 minutes for average of 26 weight tons and 103.5 measurement tons per gang hour. Usual average with such cargo is 10 weight tons or 40 measurement tons per gang hour.

Second voyage—Line-up of cargo was such that 5 opening and closings of the hatch were charged to the compartment and only a 32 per cent. increase in tonnage per gang hour was shown.

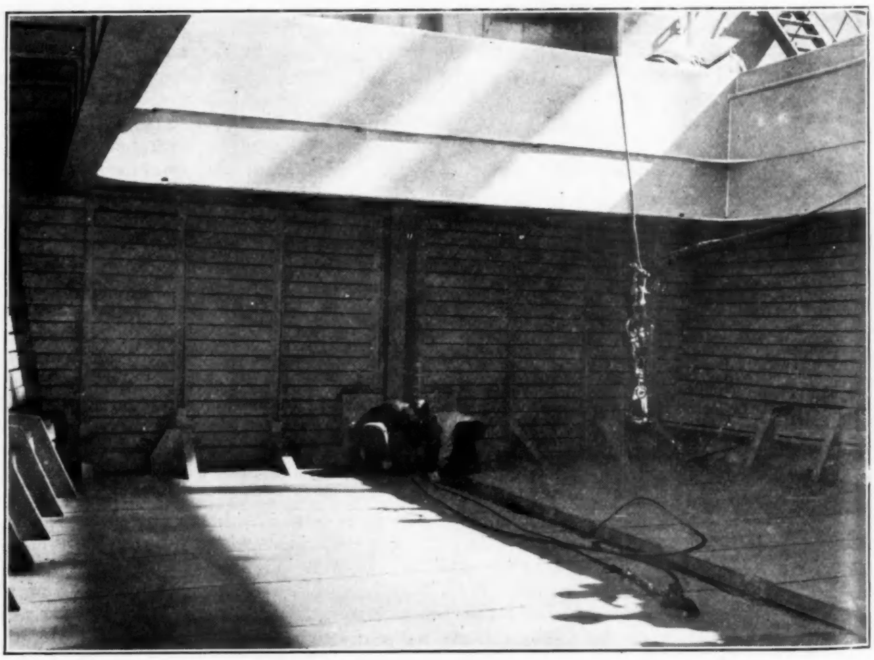
Third voyage—364 weight tons or 579 measurement tons were loaded in 9 hours 30 minutes, for an average of 38.3 weight tons and 61 measurement tons per gang hour. Usual average with such cargo is 21 weight tons or 32.6 measurement tons per gang hour.

The Rolling Wing Decks cover the recesses on each side of the hatch and are mounted on 4-in. diameter wheels which roll on flat bar tracks welded on top of the deck and hatch beams. Their height, including the tracks, is $5\frac{7}{8}$-in. A system of wire rigging co-ordinates the movement of the Rolling Decks so that when the deck on one side is rolling outboard or inboard the one on the opposite side also rolls inboard or outboard automatically. This makes it impossible for both decks to roll to the low side in case the ship takes a sudden list. The same system of wire rigging also counterbalances the Rolling Decks so that no more power is required to roll them with the ship listed than is required when it is on an even keel. The Rolling Decks can be used in all 'tween decks and lower holds except Nos. 1 and 5 lower holds.

When the ship is ready to load, the Rolling Wing Decks are moved out from the recesses with the cargo hook and existing winches until they meet at the centreline of the ship, directly under the hatch opening, where all cargo can be placed into stowage with the cargo hook that lifts it on board. This eliminates all manual carrying or dragging or cargo 20 to 30 feet over other cargo



Rolling Wing Decks being hauled to centreline of ship for loading.



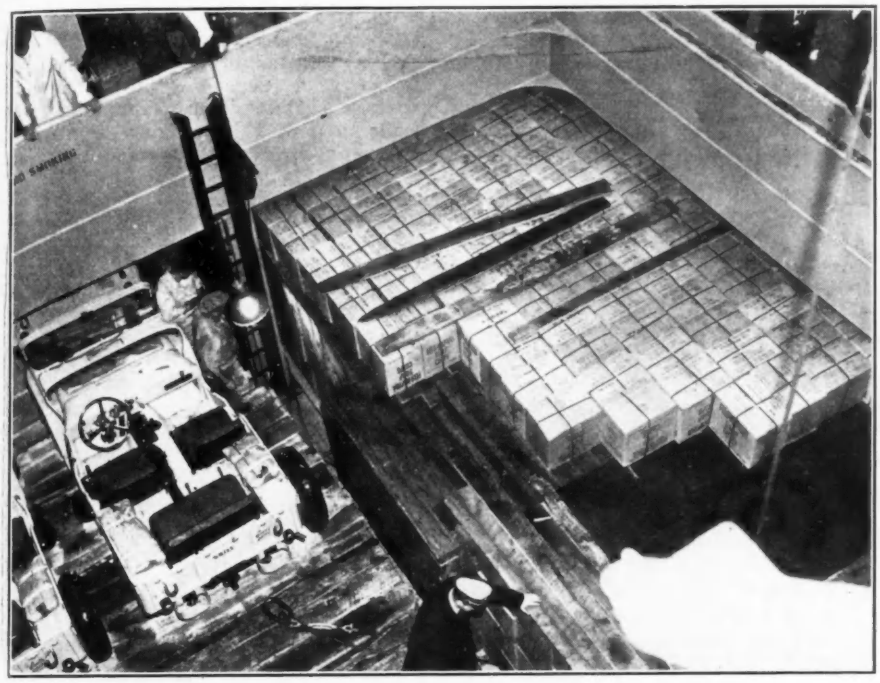
Rolling Wing Decks under hatch ready for loading.

New Methods of Loading and Discharging Cargo—continued

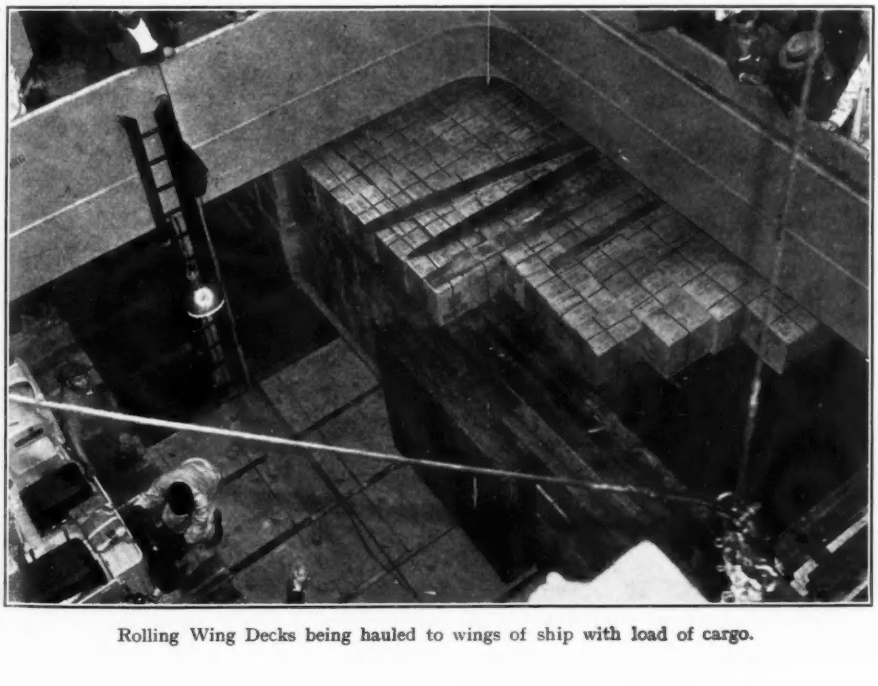
to the wings and the time now lost in improvising intricate rigging, skids and dunnage flooring for such dragging. Large savings will also be realised through the elimination of cargo damage and personal injuries frequently incurred in such work. When the Rolling Wing Decks are loaded they can be rolled into the wing recesses with the cargo hook in ·18 seconds, and then the space between them under the hatch is similarly loaded. In discharging the process is reversed. The Rolling Decks, by bringing wing recesses to squares of hatch, will simplify the planning of ship stowage as much as the removal of all covering decks, and stevedores who have used them agree that the better stowage of cargo they assure will save more space than they take up.

High cargo handling costs, damage and pilferage indicate that cargo will have to be carried in larger and stronger units; and the Rolling Decks make it practical to load the entire ship with units such as 5 to 20 ton capacity containers. Leading stevedores in American ports have publicly endorsed the possibilities of this equipment and agree that it will place the American domestic shipping routes on a paying basis. Their faith in it is indicated by the National Association of Stevedores having it demonstrated and discussed on their Panel in the 1949 American Merchant Marine Conference and at their Annual Convention on December 11 and 12, 1949.

It is claimed that the large savings recorded definitely warrant the cost of installing this equipment on existing ships, and the small increase it incurs in the cost of a new ship makes its installation a worthwhile proposition.



Rolling Wing Decks loaded under hatch and ready for hauling to wings of ship.



Rolling Wing Decks being hauled to wings of ship with load of cargo.

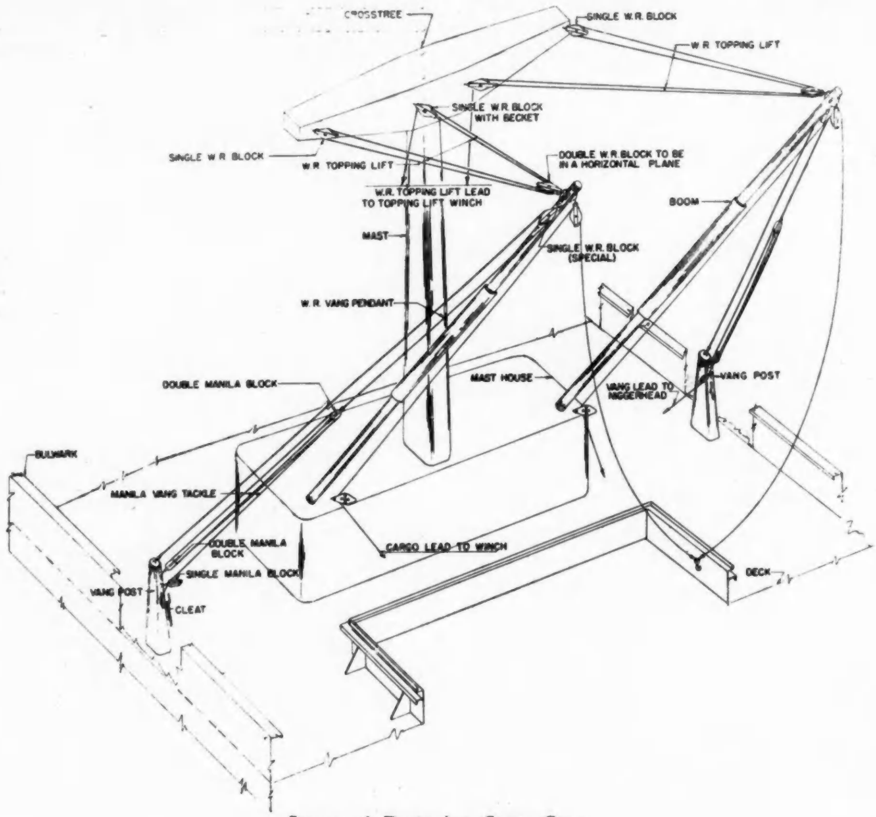
FARRELL IMPROVED BURTONING CARGO GEAR

Experience with this improved cargo gear on 15 ships during the past two years has established records showing a saving of 20 per cent. to 25 per cent. in the time and cost of loading and discharging ships with it. In one case on a Moore-McCormack Line's ship where similar cargo was loaded in similar cargo holds with and without this improved gear, the cargo hold equipped with it loaded 36.7 per cent. more cargo per gang hour than the cargo hold equipped with conventional cargo gear and topping lift winches. In another case where such a loading was obtained on a Farrell Line's ship, the No. 1 cargo hold equipped with this improved cargo gear loaded 25 per cent. more cargo than was loaded in the No. 2 cargo hold equipped with conventional gear. In this case both holds were loading packaged sheet steel of the same size.

The increased efficiency obtained with the Farrell Improved Cargo Gear is due to the fact that it combines the flexibility of the crane with the high speed burtoning or married fall method of moving loads from dock to ship and vice versa. This novel combination of the best features of the crane and the burtoning method enables one to place each load at the nearest point to its ultimate stowage without any delay. Due to the long delays encountered in changing the position of the booms with the conventional cargo gear, the boom over the hatch being fixed over the centre of the hatch or the area it covers, 90 per cent. of the loads have to be pushed or swung in an attempt to drop them as close as possible to the point of their ultimate stowage. This entails a delay of one-half minute to as much as three minutes on each load. When the loads cannot be dropped where desired, each unit in such loads has to be carried excessively long distances to ultimate stowage. These delays appear small, but when they are totalled up they amount to 20 per cent. to 25 per cent. of the time and cost of loading the ship. In addition, when loads are swung and dropped at the extremity of the swing on other cargo, a substantial amount of damage is done to the cargo.

The improvement on the conventional cargo gear consists of, placing the outboard vangs or guys on the athwartship line con-

New Methods of Loading and Discharging Cargo—continued



Improved Burtoning Cargo Gear.

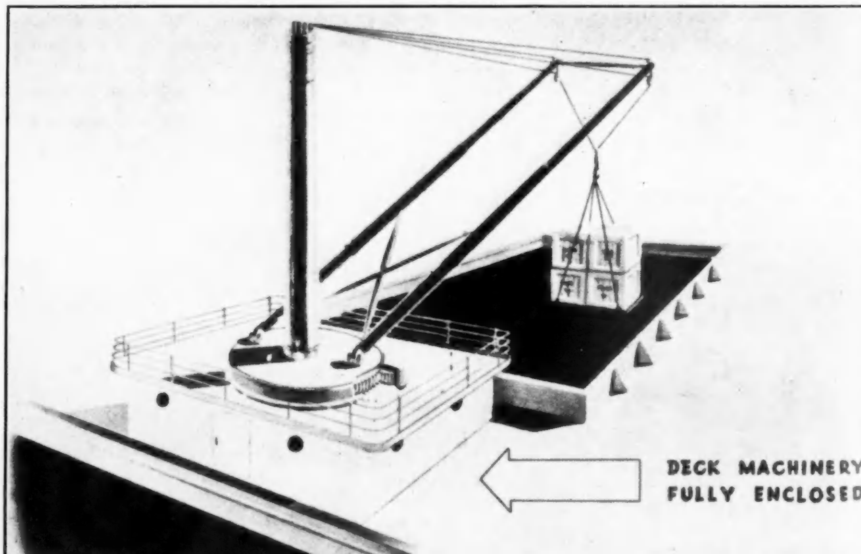
stituting the axis of the booms, thereby forming a triangle with the boom and the vang or guy; installation of a new type of wire preventer and rope outboard guy or vang, where the strain is automatically divided between the wire and rope, but it is only necessary to handle the rope in making adjustments; a new reaving of the topping-life tackles, using three blocks instead of two, one of which is placed on the centreline of the ship to make the boom gravitate inboard and eliminate the necessity of inboard vangs or guys; installation of one 5 horsepower, self-locking, worm gear topping lift winch on each boom for raising and lowering it without the load, or 12½ horsepower topping lift winches for raising and lowering the booms with the load. The controls of these winches are located near the cargo winch controls, so that the same man operates both winches. With this arrangement the boom head travels on a fore and aft line parallel to the ship's keel when it is raised or lowered without adjusting the outboard vangs or guys.

In tests of this improved cargo gear carried out by the U.S. Maritime Commission at New York, the position of the cargo booms was changed by three men from working position over the dock to working position over the offshore side of the ship in 35 seconds; from working position on offshore to the boom rests and secured for sea in 1 minute 35 seconds; and from boom rests to working position over the dock in 1 minute 45 seconds. This eliminated the necessity of crew working overtime in rigging and unrigging cargo gear as all vangs or guys are 8 to 10 feet above the decks, and remain in place, ready for working cargo, when the booms are lowered to their rests for going to sea. With the conventional gear the entire crew spends one to two days securing it for sea and rigging it up for working cargo every time the ship sails from or arrives in port, excepting very short coastal voyages, where the booms can be left in working position.

Large savings are also realized through the elimination of one-half of the vangs or guys on the booms, elimination of personal injuries frequently incurred by the crew in handling preventor and topping lift wires and frequent dropping of booms in such work. These savings, together with the saving in time and cost of handling cargo assure liquidation of installation costs in one to two years, depending on the length of voyages. Two of the installations were made on ships while working cargo without interfering with cargo operations or causing any delay to the vessel.

FARRELL POSITIVE LOAD—CONTROL CRANE

The positive load control feature of this crane will make rotating or whirling cranes practical for ships. Ship operators have seen the necessity of such a crane for many years; and several installations of the conventional whirling cranes have been tried, but they all failed because of pendulum-like swinging of loads, which prevented fast rotation. A working model of the Farrell Positive Load Control Crane built on a scale of 1 inch to the foot has proved the load control feature beyond doubt. This feature consists of supporting the load midway between the two booms with two wires extending from the load in diverging relation to each other to the boom heads or in the direction of the movement of the load. Such load control assures efficient operation by waterfront labour after a few minutes' practice.



Positive Load Control Crane.

New Methods of Loading and Discharging Cargo—continued

This crane will be mounted on the centre-line of the ship between the hatches; one for each hatch, plus a spare in case of breakdowns and for doubling up to lift double their capacity. It can be built to a 5 ton capacity without sacrificing its efficiency in handling 1 ton loads by gearing it for 3 speeds of rotation and rigging 3 sets of purchase tackle thereon. Thus, to change from one capacity to another, it will only be necessary to shift gears and change the hauling parts of the purchase tackle on the winch. One crane at each hatch will also handle more cargo in small loads than two of the conventional rigs, because its smooth operation guarantees safe handling of at least two pallets to a lift and its load spotting ability assures at least 25 per cent. more tonnage per hour than is possible with the conventional cargo gear. However, this crane rotates 360° and the spare crane can be used to double-gang any one of the 5 hatches. This feature also permits the lifting of 50 ton units in every hatch if the cranes are built to 25 ton capacity. After having this crane studied by their stevedores and qualified operating personnel, executives of eight leading steamship companies and one of the best stevedoring firms have agreed with the increased efficiency claimed for this crane and they have endorsed it in writing.

The engineering of this crane indicated that in a ship equipped with six of them versus ten conventional rigs there will be approximately 30 per cent. less cost and deadweight with the cranes.

It should be noted that all deck machinery is fully enclosed in a water-tight house. This is a great advantage, as owing to salt water and other elements on existing ships, keeping deck machinery in efficient working order constitutes one of the largest maintenance costs.

A New Method in Water Transport

By a Correspondent recently in Germany *

Some years ago it occurred to Dr. Eberhard Westphal, a German engineer, that the conventional type of inland barge is in many respects a source of waste.

It involves, for example, the construction of holding capacity which can only be used economically for part of a round trip. In most cases barges return empty and even when loaded they spend much time in waiting—for various reasons, among them difficulty of manœuvre.

Moreover, differences in the width and depth of waterways often makes necessary a double handling of loads, as goods have to be transferred from larger to smaller craft—and back again. This is wasteful.

Dr. Westphal's answer to these problems is the Amphibious Container Unit. Made of welded steel it can be mass-produced at non-specialised works, and as the pictures show, it can be linked with others in mobile units both lengthwise and (in two or three rows) sideways. The barge compound so formed is compact and easily manœuvred in wide and narrow waterways by attaching in front and behind the specially-designed propelling units shown in the insert photograph. (See Fig. 2.)

Another advantage of the container unit is that by the help of special lifting installations it can be taken out of the barge compound, and if carrying bulk traffic, such as coal, it can be completely unloaded without being touched by human labour. A glance at the diagram in Fig. 3 will show how the tipping process works.

Its load discharged, it can then be returned to its starting point by road or rail, by the means illustrated in the diagram in Fig. 1. This reduces the turn-round time considerably.

Readers will have noted the tubular shape of the unit. One of its advantages is that, when the unit is carrying bulk traffic, no extra labour is required to fill the loading space evenly. The diagram in the upper part of Fig. 3 shows why.

*Reproduced by kind permission from the February issue of the Bulletin published by the British Institute of Management.

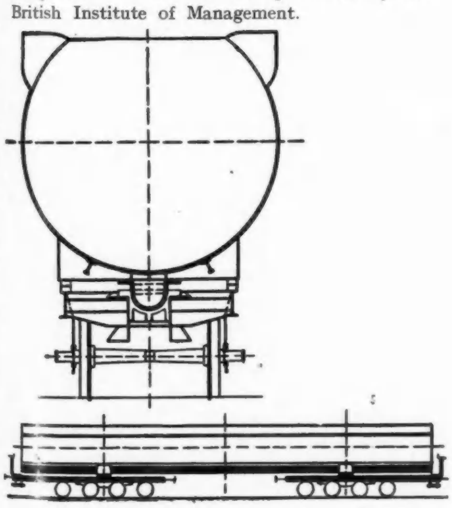
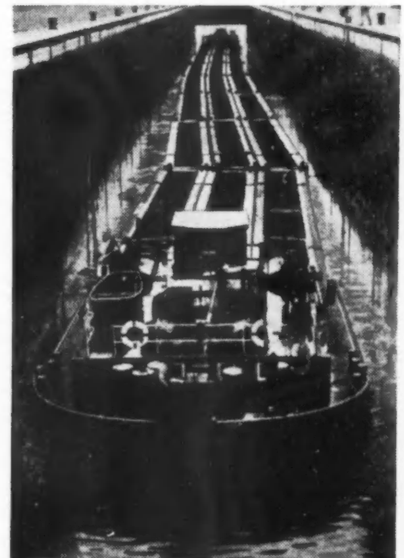


Fig. 1. Method of mounting container unit for conveyance by rail.



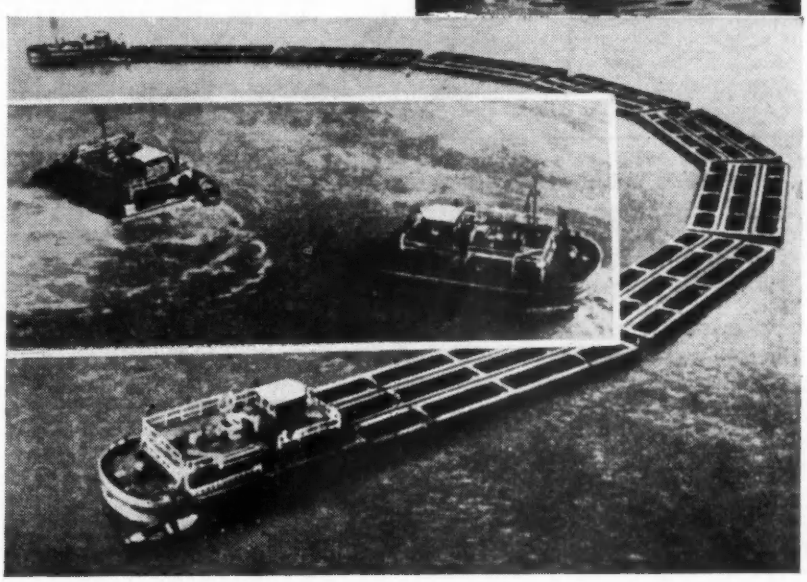


Fig. 2. Barges in a lock, barges turning and inset, propelling units.

New Method in Water Transport—*continued*

A final advantage is that the barge compound can be moved laterally to and from a quayside by the two propelling units. The new method involves less difficulty than the old, runs less risk of damage to the barge compound, other craft and the quayside.

To sum up, this new invention tries (1) to avoid capital investment in the construction of capacity which may be partly wasted; (2) to release holding space which is not required so that it can be quickly returned to its starting point for reloading; (3) to avoid double handling of loads; (4) to facilitate mechanical loading and unloading; and (5) to reduce manœuvring time.

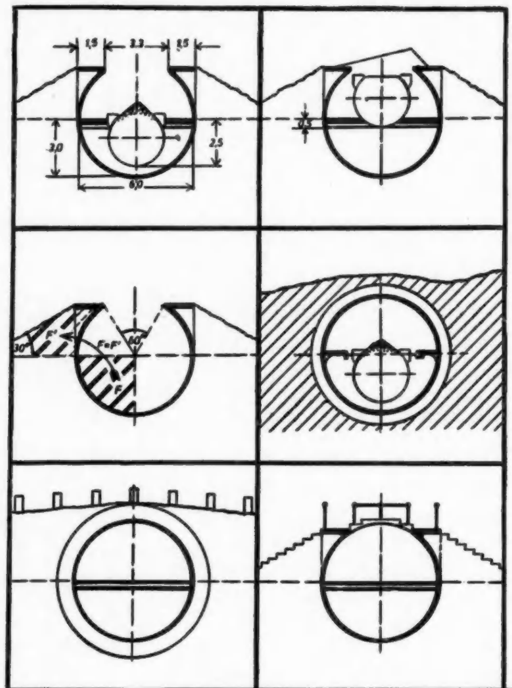
It is suggested that the invention might be useful in the United Kingdom and other countries. It may, for instance, be possible to discharge the cargoes of ocean-going steamers into container units. Later they could be marshalled and formed into separate barge compounds according to the destination of each unit. The size of each compound can be fixed to suit the nature of the waterway it has to travel. Similarly if bulk traffic from a factory to a port has to be loaded on several steamers at a number of different points, it can be loaded at the factory into as many units as are needed at each loading point in the port. The units can then be formed into a barge compound, taken by waterway to the port and split up according to the destination of each group of units.

There are many possible ways of adapting the idea to meet special needs. Britain's dense network of railways for example, should make the overland transport of amphibious units an economic proposition. And now that nearly all types of transport in the United Kingdom are controlled by one authority, it should be easier to find a method of using the units for transport on land and water.

There are two further ways in which the idea could be adapted.

First, the canals of the future need not be built wide enough to take barges of the conventional type. They can be made, as shown in Fig. 4, just wide enough to take one unit, loaded or empty. The cost of construction can then be kept down. In built-up areas the canal can be run through tunnels and in the open country roads can be led over the canals by culverts.

Second, the invention can be applied to major haulage schemes. In the U.S.A., for example, there is a project to move 52 million tons of coal and ore each year between Ohio and Lake Erie. It envisages a continuous two-way stream of materials between points about 160 miles apart—nearly 1 ton of coal per second going north and about 1½ tons of ore going south on the same continuous band. If two parallel pipelines were built to link the two focal points, the units could ply between them, to and fro, driven by the current of water in which they move. It has been calculated that a continuous stream of units could move ten times the quantities mentioned in connection with the American project—at half the speed. In the manner indicated in the lower diagrams in Fig. 4.



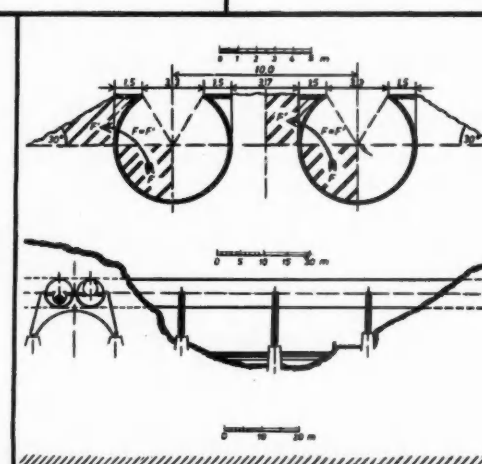


Fig. 4. Cross sections of canals for the new type barge unit.

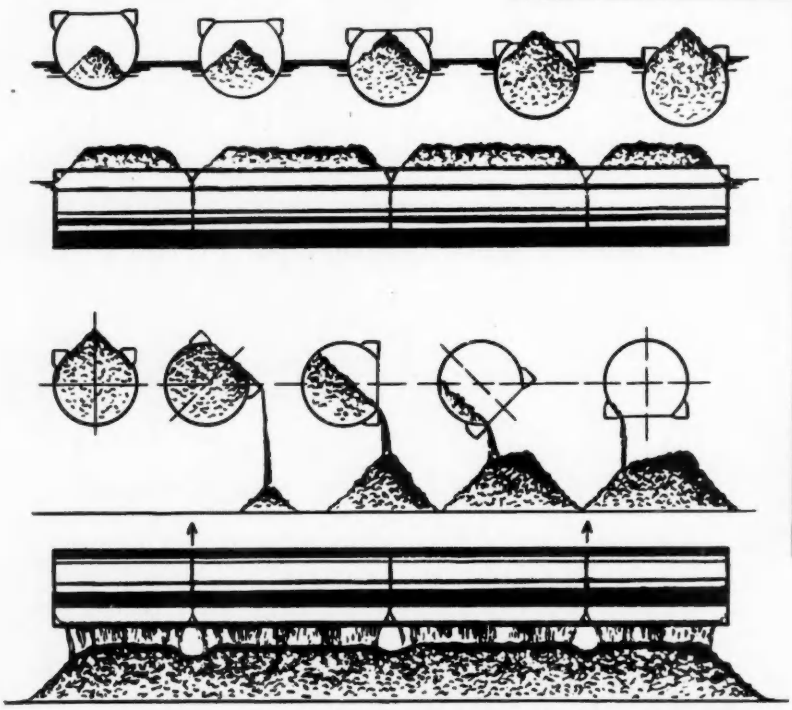


Fig. 3. Loading and unloading of units containing bulk materials.

German industry is already planning to mass-produce these units. They were first built for and used on a large scale by the *Reichswerke*, Salzgitter — a combine whose plant is still scheduled for dismantling, though the Federal German Government is making efforts to keep it going. It may be worth while studying the technical details of the invention so long as the works are intact.

Packing for Safety at the Docks

Some Suggestions for Reducing Handling, Stowage and Damage Risks

By L. G. TAYLOR, M.Inst.T.
Commercial Assistant to the Chief Docks Manager, S. Wales Docks, Docks and Inland Waterways Executive

Speaking to members of the Institute of Packaging at a Southern Area meeting recently, Mr. L. G. Taylor, M.Inst.T., Commercial Assistant to the Chief Docks Manager, South Wales Docks, Docks and Inland Waterways Executive, reviewed the responsibility of the Dock Authority in handling goods, and after describing labour and handling problems, and what he thought was the ideal layout of a quay for dealing with general cargo, went on to advise manufacturers and packers of steps they could take to minimise handling, stowage and other damage risks. The following are some of the points made by Mr. Taylor:

At most docks in U.K., the cargo workers are paid on a piecework basis. Their primary consideration is therefore the handling of the greatest amount of cargo in a given time. It will be readily appreciated therefore that they do not work in "kid gloves," and that good supervision is needed to curb a natural tendency to put speed before safe and careful handling.

There has been a loss of specialisation in the docks. Before decasualisation, men specialised in the handling of certain classes of cargo. The tonnage output of such specialist gangs was often amazing. But one of the conditions nowadays is that registered dock workers must be prepared to take any work offered to them. This sometimes means using less experienced men on particular jobs.

In the main, apart from dropping and spilling, the major risk of damage to packages inherent in most cargo handling gear is crushing by wires, ropes or chains carrying the load. Such crushing can be avoided by the intelligent use of "spreaders," but if the spreaders are long enough to keep the chains or wires away from the load, thus eliminating any grip on the packages, the risk of spilling is increased.

Another cause of damage is the "hob-nailed boot." It is frequently impossible to avoid walking on cargo in the hold, and this, on comparatively light cased goods is not calculated to improve their condition. Walking or running boards placed over the cargo eliminate this trouble, but as dockers are piece-workers, who do not increase their tonnage earnings by carrying running boards around holds, it requires good supervisors to see that proper use is made of them.

There are many ways in which packers can help the dockers who have to handle goods. Priority should perhaps be given to the avoidance of the smooth cubic case which has nothing to grip and which can only be lifted by wedging a corner in the tummy and getting both arms around it. When cases are small enough to be man-handled—apart from the very small or light variety—an additional piece of 1-in. timber securely fixed at the top of the ends and sides would be better than nothing.

During the war, many small packs had rope handles. There is no doubt that they facilitate handling, but they make it very difficult to get a tight stow in the ship's hold. Whichever way you fit them together you get rope to rope, which means there may well be too much "spring" in the cargo, which may in turn result in "shifting cargo"—a shipmaster's nightmare—in bad weather. Another drawback is that frequently the ropes are simply knotted through two holes, so that if the commodity is anything which would suffer damage from atmospheric conditions, it would have to be packed in an interior shell.

Regarding the size and weight of small cases which need man-handling to make them into "sets" for slinging, I think they should not exceed in length the easy spread of a man's arms when he is in an attitude of lifting—or about two feet; the width should be something over which the lifter can plumb the centre without having to lean forward out of balance. This would place it at about 18 inches. The depth should not exceed a height which allows the lifter to carry it with his arms fully extended. If the weight is much in excess of 56 lb. it becomes a two-man job. We find that goods move faster under than over that weight.

With baled goods, generally press-packed and banded, such as wool, cotton linters, rags, etc., it is in such jobs as sorting to marks, etc., in shed that excessive weight tells on the men. Most people who have had to handle what we call "double dumps" of wool—weighing about 5½ cwt.—agree they are too large and too heavy. Even the single bales are between 2 and 3 cwt. each.

With cases too large for man-handling, those which sit flat on the floor have to be levered up with a pinch bar. It never does a case much good. But how else can dockers get their slings round it, except by "dogs" or case grips which are not suitable when men are working in a ship's hold below, and which in any case never do the package much good. With such heavy cased goods, 3-in. to 4-in. cross battens should always be used to raise the bottom off the floor, or other means be provided to accommodate lifting chains or wires.

When, for heavy machinery, lifting lugs, rings or other devices are provided outside the case, it is good practice to mark them "Sling Here." Dockers are not engineers and it is quite easy to mistake for a lifting ring something that is only intended for securing to a deck. Several nasty accidents have resulted from such mistakes. A valuable piece of machinery was being lifted by what was thought to be rings which, however, pulled out, and dropped the machine on to the quay. Even more distressing was the instance of some large horse boxes, fitted with four steel rings in ideal lifting positions. All was well until a horse in one box got frightened twenty feet up, and began stamping with the result that the bottom of the box fell out, dropping the mare on the quay, where she had to be destroyed. It was not until after this happened that we were told that the rings were not for slinging but for securing the boxes to the deck. "Not for Slinging" should have been stencilled on the boxes.

If not lifting attachments are fitted to heavy packages, it is always a great help to mark the actual slinging points, and always to indicate the gross weight of the package on the outside. With large items such as machinery, the containers often take peculiar shapes, larger at one end than the other, and so on. It is more important than ever to provide lifting lugs or to clearly mark the slinging points. You cannot expect the docker to know, for instance, that the smallest end may be the heaviest. It is quite easy to drop such a case by wrongly assuming that it can be slung in the normal manner. Another point about such cases is that lacking the inherent strength of a cube they may want additional stiffening inside, particularly at points where they have to take the pressure of the slings or the stresses set up by lifting.

The question of pictorial markings is being considered by the Institute of Packaging. The system has not yet been widely adopted. I prefer suitable wording. If pictorial markings are adopted I suggest markings such as arrows, which are readily understandable even to the meanest intelligence. The upright port wine glass used for glass or fragile goods is not always comprehended. One docker thought it actually meant that the contents were wine glasses. Words stencilled near the pictorial mark would be an advantage.

Whatever form of marking is recommended, I strongly advise stencilling it on *all* four sides *and the top* of the case. Sometimes only the top can be seen when discharging from a hold.

If it is really necessary to keep cases one way up, and the cases are so marked, then don't blame dockers for taking a little latitude in handling when they see such cases arrive in your lorries laid on their sides. One firm with works near the docks found they could get a bigger load on the lorry by so doing, and the short haul caused no damage. But they forgot the effect on the dockers, and suffered losses as a result. When dealing with smaller packages, it is definitely beneficial if they can be handled any side up.

For heavy lifting traffic, give the Dock Authority prior notice of the consignment. Such equipment as 50-ton and 100-ton floating

(continued at foot of next page)

Notes of the Month

IMPROVEMENTS AT THE PORT OF BIZERTA.

The following improvements have been completed in Bizerta Harbour: All lights, buoys, etc., are now working and vessels may enter or sail at night, although it is advisable to inform the harbour master in advance. All principal berths are fitted with water connections to supply ships while working, and a floating crane with a lifting capacity of 20 tons has been added to other facilities. Three pilots are now available.

ANOTHER PORT FOR EAST PAKISTAN.

A committee has been appointed by the Government of Pakistan to consider the practicability of constructing an anchorage for sea-going vessels in East Pakistan. The site of the proposed anchorage which ultimately is likely to be turned into a second port of East Pakistan will be Chalna, about five miles from Khulna Town. The report of the committee is expected to be submitted to the Government soon, and it is hoped the anchorage will start functioning from December this year.

PORT PROJECT NEAR MACAO.

A recent report from Hong-Kong says that Chinese Communists occupying Chungshan district, next to Macao, are working on a scheme for the immediate opening up of a trade port at Wan Tsai, an island opposite Macao. A number of Russian technicians are working on the port scheme, which includes the immediate construction of an electric power plant, fish market, wharves, warehouses, etc. The Communists have also forbidden towboats to call on Macao without government permission.

EXTENSIONS AT THE PORT OF CHITTAGONG.

The Pakistan Government has recently approved further expansions to Chittagong port to enable five 500-ft. ships to be accommodated at the jetties at the same time. It is hoped that the annual capacity of the port will thus be increased to some 3 million tons. Most of the export part of this tonnage will be jute, for which there is a steady demand from Spain, Chile, Sweden, the Argentine, as well as from countries of the British Commonwealth.

TIDAL MODEL EXPERIMENTS FOR THE PORT OF DUNDEE.

Further experiments are to be carried out by Dundee Harbour Trustees by means of the Tay tidal model to determine the best means of carrying out projected harbour developments. Following the submission of a report on recent experiments, it was decided to continue them with a new design for the proposed waterfront extension with a view to eliminating cross tides which would make ship handling difficult. It was also agreed to carry out experiments on the model with regard to the channel at the entrance to the river. This will involve the use of a wave-making machine.

FINANCIAL AID FOR TURKISH PORTS.

The International Bank is advancing to Turkey two loans, totalling \$16,400,000, for port development and grain storage facilities. A \$12,500,000 loan for development of projects in major Turkish ports will be for a term of twenty-five years with an interest rate of 3¼ per cent. plus 1 per cent. commission, amortizing payments beginning in 1956. The second loan of \$3,900,000 for construction of grain facilities is for a term of eighteen years with an interest rate of 2⅞ per cent. plus 1 per cent. commission, amortizing payments beginning in 1954.

STEVEDORES CO-OPERATIVE COMPANY TO BE REGISTERED.

At a meeting of stevedores and dockers, held in Greenwich Town Hall on 20th July last, approval was given to the articles of association for the new co-operative stevedoring company to be registered under the name of Associated Stevedores London, Ltd., and nine directors were elected. The meeting authorised a share capital of £8,000, of which £7,000 is to be available to individual members of the National Amalgamated Stevedores and Dockers, no member to hold more than four Ordinary shares of £1 each. It was agreed to create 3 per cent. Preference shares which branches of the N.A.S.D. would be eligible to take up to a maximum total of £1,000.

BENGHAZI HARBOUR TO BE DREDGED.

A small grab dredger and two hopper barges have been towed from Malta to Benghazi by an Admiralty tug, and it is hoped that after dredging has been finished, there will be a navigable depth of 18-ft. in the harbour. The work is expected to take about 18 months to complete.

DEVELOPMENT OF KANDLA PORT.

The Development Commissioner for the Port of Kandla (Cutch), on instructions from the Government of India, is visiting the United Kingdom and Holland to contact consulting engineers in connection with the development of Kandla Port. He will also discuss with engineering firms the possibilties of economic reclamation of Kandla Port by dredging, and will inspect the equipment available.

Southampton Docks

Transfer to Docks and Inland Waterways Executive

The British Transport Commission announce that as from September 1st next the management and operation of Southampton Docks will be transferred from the Railway Executive to the Docks and Inland Waterways Executive. The decision, the Commission point out, is in accordance with the policy they announced in December, 1947, with regard to the transfer of former railway-owned ports, other than those packet ports which are links in the passenger services between Great Britain and the Continent, Ireland and the Channel Islands, and is in accordance with the policy approved by Parliament in the Transport Act which created a special Executive to assist the Commission in regard to its docks and inland waterways.

"Under the arrangements proposed," the Commission's announcement continues, "the docks at Southampton will be administered by the Docks and Inland Waterways Executive as a self-contained organisation, and officers and staff employed on dock work will be transferred to that Executive. The marine services of the Southern Region of the Railway Executive will remain, with their staff, under the management and control of the Railway Executive.

"Mr. R. P. Biddle, at present Docks and Marine Manager to the Railway Executive at Southampton, will continue to occupy that post with joint responsibility to the Docks and Inland Waterways and to the Railway Executives for docks and marine matters respectively. In this way, the valuable services and long experience of Mr. Biddle will remain available to both Executives and to the users of the port, and administrative continuity will be preserved.

"Provision will be made in the new organisation for the fullest co-operation between the local officers of the Executives and with shipowners and importers and exporters in order that the important passenger and freight traffic in and out of the port may continue to be worked with the greatest possible efficiency and that the close inter-working between the docks and the railway services of the Southern Region of the Railway Executive may be preserved.

"There will be the closest consultation between the Executives and the trade unions concerned in connection with the details of the staff arrangements to be made, and the Commission are confident that any staff questions which may arise out of the transfer will be settled satisfactorily."

Packing for Safety at the Docks

(continued from previous page)

cranes cannot always be made immediately available without programming their work.

For packages small or large, if they have to be examined by Customs at the port of shipment, make arrangements for re-packing.

When wording is applied to packages, take into account the overseas port labour. Dock workers are not necessarily linguists. It is therefore always an advantage to mark instructions in English and the language used at destination.

TENDERS.

TO CRANE MAKERS.

The Dublin Port and Docks Board is prepared to receive Tenders for the supply and erection of Two, or, at the option of the Board, Three 6-Ton Electric Portal Wharf Cranes at Dublin Harbour.

Outline Drawing, Specification, Special and General Conditions of Contract, Schedule and Form of Tender may be obtained from the Engineer's Office, Dublin Port and Docks Board, East Wall Road, Dublin, between the hours of 10 a.m. and 4 p.m. on weekdays, 10 a.m. to 12 noon on Saturdays, on payment of a fee of £5 0s. 0d., which will be returnable to bona fide Tenderers.

Sealed Tenders, endorsed on the outside "Tender for 6-Ton Cranes," should be sent to The Secretary, Dublin Port and Docks Board, 19, Westmoreland Street, Dublin, so as to reach him not later than Wednesday, 30th August, 1950.

The Board does not bind itself to accept the lowest or any Tender.

By Order,
R. F. LOWE,
Secretary.

Port and Docks Office,
Dublin.
3rd July, 1950.

TO CRANE MAKERS.

The Dublin Port and Docks Board is prepared to receive Tenders for the supply and erection of Two 10-Ton Electric Portal Wharf Cranes at Dublin Harbour.

Outline Drawing, Specification, Special and General Conditions of Contract, Schedule and Form of Tender may be obtained from the Engineer's Office, Dublin Port and Docks Board, East Wall Road, Dublin, between the hours of 10 a.m. and 4 p.m. on weekdays, 10 a.m. to 12 noon on Saturdays, on payment of a fee of £5 0s. 0d., which will be returnable to bona fide Tenderers.

Sealed Tenders, endorsed on the outside "Tender for 10-Ton Cranes," should be sent to The Secretary, Dublin Port and Docks Board, 19, Westmoreland Street, Dublin, so as to reach him not later than Wednesday, 30th August, 1950.

The Board does not bind itself to accept the lowest or any Tender.

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Dublin.
3rd July, 1950.

APPOINTMENTS.

THE PERSIAN GULF LIGHTING SERVICE.
APPOINTMENT OF SUPERINTENDENT OF LIGHTS AND BUOYS.

Applications are invited for the appointment of **Superintendent of Lights and Buoys** in the Persian Gulf. Minimum salary £1,200 p.a., subject to adjustment for qualifications and age. Contributary pension scheme. Free house, electricity and fuel. Free passages on appointment and for leave in the U.K.

Candidates must be under the age of 40 and are required to be experienced in Lighthouse Engineering, capable of supervising the installation, upkeep and maintenance of navigational aids and to have a sound administrative ability. A knowledge of Arabic or Hindustani would be an advantage.

Further particulars and application forms from: The General Manager, The Persian Gulf Lighting Service, 51, Bishopsgate, London, E.C.2.

WANTED: DESIGNER DRAUGHTSMAN for sluice and dock gates. Reply in writing, giving technical qualifications and experience and salary required to Head Wrightson & Co., Ltd., 20, Buckingham Gate, London, S.W.1.

FOR SALE.

SEVERAL UNUSED 6-TON STOTHERT & PITT ELECTRIC PORTAL CRANES, 63-ft. centre jibs, 60-ft. max. radius. Power travelling, 15-ft. rail gauge. 86 h.p. 460-480 v. D.C. motors driving 57 k.w. generator supplying 220 v. D.C. to crane motors. Generator mounted in special housing on portal frame. George Cohen Sons & Co., Ltd., Wood Lane, London, W.12. (Tel.: SHE 2070.)

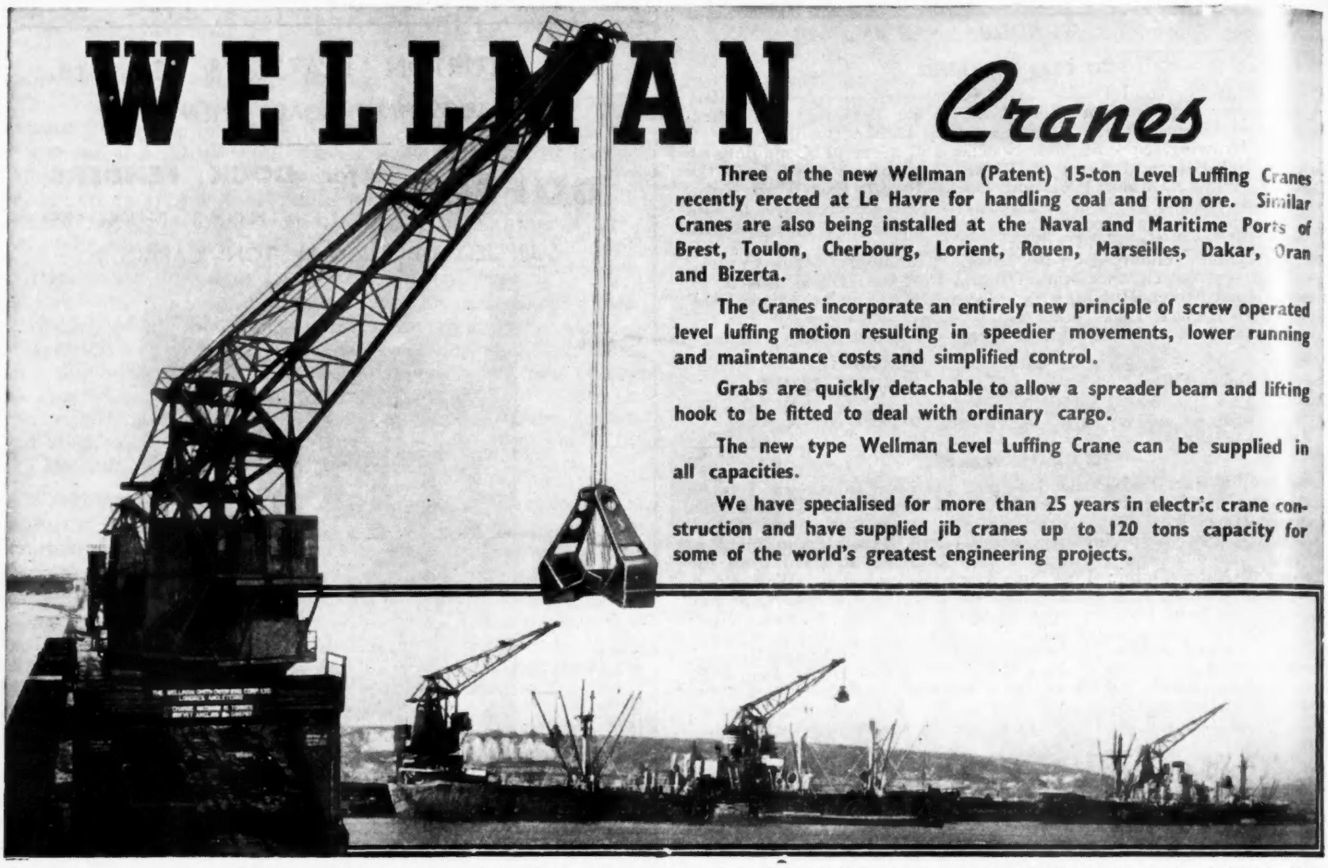
BACK NUMBERS REQUIRED

During the past few months, we have received a number of requests for back numbers, In particular the

YEARS 1940 – 1947

are urgently wanted.

Will anyone who has ANY issues for disposal kindly write to:—"The Dock & Harbour Authority," Subscription Dept.: 19, Harcourt Street, London, W.1



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